

THE METAL INDUSTRY

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United Chromium Wins Patent Suit

The Decision Handed Down by Judge Thomas of
the United States District Court in the Case of
United Chromium vs. International Silver Company

THIS is a bill in equity which charges the defendant with infringement of Letters Patent No. 1,581,188 issued to Colin G. Fink on April 20, 1926, on an application filed December 19, 1925. By various mesne assignments title to the patent in suit now rests in the plaintiff corporation.

The defense in this case has been conducted by Weisberg and Greenwald, chemists of New York City, who designed and installed the plating plant for the International Silver Company in Meriden, in this District. So far as appears in this record the International Silver Company never did anything more than employ Weisberg and Greenwald to equip its plant with a chromium plating outfit and start the operation of it. The jurisdiction of this Court is therefore invoked because of the facts just set forth which show that Weisberg and Greenwald of New York City are the real defendants and the International Silver Company is the nominal defendant using the product of the New York chemists.

On June 20, 1928, and before this suit was brought Fink filed a disclaimer limiting claims 1, 2, 4, 5, 6, 10, 11, 12, 13 and 15, as will hereinafter appear when the disclaimer is under discussion.

The claims in suit, in addition to those limited by the disclaimer are 3, 16 and 18. Claims 7, 8, 9, 14 and 17 are not in issue.

The invention described and claimed in the patent in suit relates to electroplating, and more particularly to a process of electrodepositing chromium from solutions of chromic acid.

The invention claimed by the patentee is, as admitted in the patent, only an improvement in the art of chromium plating, as the literature on the subject dates back many years. Professor Fink has made a deep study of the subject matter over a period of years and was familiar with the history of the art and in the specification said:—

"For nearly a century there has appeared in the literature considerable matter in respect to chromium plating, and in that literature the use of chromic acid as an electrolyte, as well as the use of various so-called addition agents has been proposed. Notwithstanding these disclosures, a practical and commercially available process of electroplating chromium has not heretofore been known, nor have any of the attempts to establish the commercial art of electro-depositing chromium ever satisfied the test of actual commercial requirements. What attempts have been made have always given uncertain and unreliable results and have resulted in ultimate failure as a reliable or satisfactory commercial process."

Professor Fink then continues to describe the invention, and it can be no better stated than in the specification where he says:—

"I pass an electric current (from an anode to a cathode, the latter serving as the object on which the metal is to be deposited) through a suitable chromium-carrying electrolyte solution, in the presence of a catalyst. The catalyst is, as usual, a bystander which does not enter into the electro-chemical decomposition. The chromium-carrying electrolyte which I have found suitable for my process, is a solution of chromic acid, its degree of concentration as regards baths of commercial interest ranging from about 150 grams per litre to saturation.

"The catalytic agent which I use is one having an acid radical which is stable in the bath and which remains stable under the actions which occur in the process when the current is passed through the bath. This catalytic agent is one which performs its action at the cathode."

Among the acid radicals proposed by the patentee is an acid having a sulphate radical which is represented by the chemical symbol SO_4 . The S stands for sulphur, the O for oxygen and so the SO_4 is the sulphate radical which is the catalyst of the patent.

The inventor discloses and emphasizes five rules essential to a continuous and commercial operation and asserts that these rules transformed the art of small and impractical laboratory experiments to what he had been for some years seeking, viz., a continuous, practical and commercially successful chromium

plating process. These rules are carefully set forth in the specification and are as follows:—

1. In preparing the electrolyte all of the stable radicals (e. g. SO_4) must be computed whether originally in the chromic acid, in the catalytic agent, or otherwise entering the bath.
2. The amount of stable radicals (catalytic agent) in the bath should approximate 2.5 grams,—be not less than one gram, and not exceed 5 grams of sulphate radical per liter of a solution containing 250 grams per liter of chromic acid.
3. The quantity of the catalytic agent should be regulated within said limits for continuous operation.
4. By adding to or subtracting from the quantity of catalytic agent (stable radicals) already present in the chromic acid solution the necessary amount to bring the total amount up to or down to the given limits.
5. For temperatures of 15°C to 40°C the proper film is obtained with current densities from $\frac{1}{4}$ to 1 ampere per square inch.

The specification then concludes and asserts, in effect, that if these rules are observed there will result a practical, reliable and **commercially** available and successful process for electrodepositing chromium from chromic acid solutions and a reliable and **commercially** adaptable method of preparing the chromic acid electrolyte. The evidence shows that these rules were original with Professor Fink and were only discovered by him after years of research and laboratory experiment in the laboratory at Columbia University where he was and is professor in chemical engineering and head of the Department of Electro-Chemistry. He asserts, and I find from the evidence, that when these rules are followed commercial success,—as distinguished from mere laboratory experiments which at times are successful as well as unsuccessful,—a practical and continuous electrolyte is assured. Without an adherence to these rules no process can be **commercially** successful. But the importance of the correct solution dominates the whole theory of successful chromium plating for commercial purposes.

It is alleged by the plaintiff that prior to the invention described and claimed in the patent in suit, (which consists in the simultaneous application of the five rules above set forth, some of which are not new per se), chromium plating was limited to a practice in laboratories and was a failure when carried beyond the laboratory limits. All through the specification the patentee emphasizes the importance of commercial success and the evidence shows that the commercial success was the result accomplished by simultaneous application of the rules mentioned supra. The evidence adduced clearly establishes the fact that notwithstanding all the experiments which had been made by many highly trained scientists through a period of nearly a century, no satisfactory **commercial** process of chromium plating was found prior to the discovery by the patentee of the five rules enumerated. Today chromium plating seems commonplace as we find it on all automobile hardware whether on the cheapest or highest priced cars. It is generally applied today on all bath room and plumbing fixtures,—on so-called silver sets and silverware,—on many articles of cheap jewelry as well as on many other articles of manufacture and which are in general use. Chromium is a very hard metal and resists rust and wear better than any other and is not liable to chip or crack or peel as is the case with nickel plating. Besides it requires no especial care and always keeps

bright without continual polishing. It has many advantages over any of the other metals used in plating before 1927. Prior to Fink there was no really practical, satisfactory, successful and commercial chromium plate. The commercial success of Professor Fink's method consists not only in producing chromium-plated articles of every kind and description which meets in all fields the requirements of the trade and the public in general but also because the plating process is made continuous which obviates waste in the electrolyte in the steady plating operation day in and day out. Both of these features were unknown prior to the patentee's invention. The plating on certain pieces of metal were, at times, nearly a success and often they were partly a failure, or a complete failure. The electrolyte had to be renewed after each run or after several runs, that is, after each or after several plating operations and so could not be carried over and used day after day. The patentee discovered that for commercial plating the fundamental and essential thing was to regulate the concentration of the catalyst acid radical (SO_4) at the start, and always, so as to secure and maintain the ratio of the chromic

acid and catalyst acid radical $\frac{\text{CrO}_3}{\text{SO}_4}$ within definite limits and preferably at $\frac{100}{1}$. Although expressed as

a single thing,—the essential thing is really three things in one and these three ideas disclosed in the Fink patent in suit are as follows:—

- I. Knowledge that the catalyst acid radical is the activator of a chromic acid bath, converting it into a chromium plating bath and is, therefore, the specific thing to regulate.
- II. Adjustment of the concentration of the SO_4 radical, so as to secure a starting bath within

definite limits of the ratio $\frac{\text{CrO}_3}{\text{SO}_4}$, and,

preferably, at one hundred to one.

- III. Regulation of the concentration of the SO_4 radical within the given limits of the ratio

$\frac{\text{CrO}_3}{\text{SO}_4}$ for continuous operation.

The first and second point secure a proper starting bath and point 3 secures a continuation of the process.

The prior publications and prior patents relied on by defendant do not teach the patentee's invention. On the contrary, they emphasize the fact that Fink's "regulation" is one of the missing links in all prior chromium-plating efforts. Defendant attempts to supply this link from other metal plating arts. But inasmuch as a chemical action is involved here, analogy does not go a long way, because, while one can predict with confidence in mechanics in some instances, and in some cases where mathematics can be applied, in chemistry one almost entirely fails. In chemistry one cannot anticipate a result. A result may be obtained only by experiment.

Such is the established law. In *Corona Co. v. Dovan Corp.*, 276 U. S. 358, Chief Justice Taft, on page 368 said:—

"The catalytic action of an accelerator can not be forecast by its chemical composition, for such action is not understood and is not known except by actual test."

So, too, in *Tyler v. Boston*, 74 U. S. 327, Mr. Justice Grier said on page 330:—

"Now a machine which consists of a combination of devices is the subject of invention, and its effects may be calculated a priori, while a discovery of a new substance by means of chemical combinations or known materials is empirical and discovered by experiment."

The Second Circuit Court of Appeals in *General Electric Co. v. Laco-Philips Co.*, 233 Fed. 96, affirmed Judge Mayer and adopted his opinion in so doing. Judge Mayer held that the expert in that case stated the rule in the following way:—(page 103),

"Chemistry is essentially an experimental science, and chemical provision is as impossible today, in spite of the accumulation of the great knowledge, as it was in former times."

See also *Naylor v. Alsop*, 168 Fed. 911; *Stevens v. Keating*, 2 Web. 181; *Toledo Rex Spray Co. v. California Spray Chemical Co.*, 268 Fed. 201.

Professor Fink discovered a latent difficulty, and he located that difficulty only after repeated experiments and failures. When the difficulty had been definitely determined and located, he then had to hunt for the remedy. After continually experimenting he finally found the remedy and he is therefore entitled to the fruits of his labors. We have here a situation similar to one which was before the Circuit Court of Appeals for the Third Circuit in *Consolidated Window Glass Co. v. Window Glass Machine Co.*, 261 Fed. 362, and Judge Buffington, speaking for that Court, used language especially apposite here. On page 373 he said:

"It is to be noted that the inventions made involve . . . the unusual feature of first locating or discovering the difficulty to be overcome and its relation to the whole problem, before any inventive steps were taken to solve it. In other words, these patents involve, so to speak, two series of inventions: First, discovering the difficulty; and, second, discovering means to overcome that difficulty."

Patentable novelty is sometimes found in discovering what is the difficulty with an existing structure and what change in its elements will correct the difficulty even though the means for introducing that element into the combination are old and their adaptation for the purpose involves no patentable novelty. *Miehle Printing Press & M. Co. v. Whitlock Printing Press & Mfg. Co.*, 223 Fed. 647. Professor Fink first discovered the root of the difficulty and then discovered the remedy. The root of the difficulty was the variation in ratio of CrO_3 to SO_4 , and the remedy was the adjustment and regulation of that ratio within the limits specified in the patent in suit.

The published experiments of Carveth and Curry as well as those of Sargent and Schwartz, on which the defendant relies, were those carried on in the laboratory and with only very small quantities of electrolytes. Their baths did not last beyond one operation and only small pieces of metal were plated. They were non-continuous, non-commercial laboratory experiments. Those publications cannot be permitted to anticipate because, inter alia, the proportion of SO_4 or other catalytic radicals contained in the chromic acid is not set forth. The documentary evidence as well as the oral testimony in this case is filled with accounts of speculations on this subject and the lengthy discussions are veritable lectures of great interest and all given by men of the highest standing in their profession as well as in this art. And these publications have been introduced in evidence by defendant not only to minimize Fink's

invention but even to defeat it. Such efforts cannot succeed and they ought not to succeed. I regard the situation here as somewhat analogous to the one set forth in *American Stainless Steel Co. v. Ludlum Steel Co.*, 290 Fed. 103 and Judge Hough, speaking for the Circuit Court of Appeals for the Second Circuit, uses language quite applicable here. On page 105, he said:

"There are many inventions which seem to have been gathered, as it were, from the scrap heaps of human effort. They appear to observers as the results of accident, rather than intelligent design. But where men, doubtless well equipped for a particular sort of work, have hoped and investigated and even prophesied as to what could be done, but never did it, and other men similarly equipped have by intensive study and skillful experiment succeeded, such success commands and should receive a greater need of intellectual appreciation than is accorded even to the cleverness of picking up and utilizing an unconsidered or discarded trifle. When to the scientific triumph of succeeding where other scientists have failed is added the development of a new branch of industry, the word 'pioneer' may well be accorded to the patent which describes and defines, even though lamely, the essentials of such success."

"Half a century ago Woods and Clark (British No. 1,923 of 1872) filed provisional specification for an 'improved alloy for anti-acid metal'; but they never completed their application. Of this abandoned disclosure defendant declares that these men 'taught the world . . . that high chromium ferrous alloys, consisting of low carbon Bessemer steel and high chromium content, with more or less tungsten,' could be used to produce stainless alloys, and it is urged that 'the patents in suit have added nothing to that knowledge.' On the contrary, our inference is that Woods and Clark must have thought little of their own concept, as they dropped the matter at once; while examination of their disclosure shows that their preferred alloy for 'anti-acid metal' was made in proportions wholly wrong, while their methods of production were merely impossible. They were perhaps among the prophets; but it requires more than prophecy of what may be done, or than declarations of what ought to be accomplished, to make a good patent reference, not to speak of an anticipation. It is necessary to show with reasonable certainty how the desired result can be accomplished. *Westinghouse, etc., Co. v. Great Northern Co.*, 88 Fed. 258, 31 C. C. A. 525."

Consequently the publications in evidence can not vitiate the letters patent subsequently issued to Fink. In *Seymour v. Osborne*, 78 U. S. 516, Mr. Justice Clifford on page 555 said:

"Patented inventions cannot be superseded by the mere introduction of a foreign publication of the kind, though of prior date, unless the description and drawings contain and exhibit a substantial representation of the patented improvement, in such full, clear, and exact terms as to enable any person skilled in the art or science to which it appertains, to make, construct, and practice the invention to the same practical extent as they would be enabled to do if the information was derived from a prior patent. Mere vague and general representations will not support such a defense, as the knowledge supposed to be derived from the publication must be sufficient to enable those skilled in the art or science to understand the nature and operation of the invention, and to carry it into practical use. Whatever may be the particular circumstances under which the publication takes place, the account published, to be of any effect to support such a defense, must be an account of a complete and operative invention capable of being put into practical operation."

He also cited Webster's Patent Cases p. 719, which reads:

"If the invention be not described and published as a complete, perfected and successful invention, but be published as an account of some experiment or by way of suggestion and speculation as something which peradventure might succeed, it is not such an account as will vitiate subsequent letters patent."

See also *The Wood-Paper Patent*, '90 U. S. 566; *Union Carbide Co. v. American Carbide Co.*, 181 Fed. 104; *Parke-Davis & Co. v. H. K. Mulford Co.*, 189 Fed. 95; *Permutit Co. v. Wadham*, 13 Fed. (2d) 454;

Naylor v. Alsop Process Co., 168 Fed. 911; United Nickel Co. v. California Electrical Works, 25 Fed. 475; Tannage Patent Co. v. Donallan, 93 Fed. 815.

The evidence regarding commercial success is persuasive. It abundantly shows that over a long period of dreary years constant effort failed from a commercial point of view. After the advent of the patent in suit it grew from small proportions in 1926, until the year 1929 showed the receipt by the plaintiff of \$486,159 from royalties alone paid by 202 licensees scattered all over the United States. So I conclude that if commercial success ever counts in favor of patentability it must count heavily here because of the very fact that no one at any time prior to Fink had ever been able to electroplate chromium and make it a commercial success.

Plaintiff filed a disclaimer, disclaiming from claims 1, 2, 4, 11 and 12 any method of electrodepositing chromium in which regulating a radical component of the bath (other than or in addition to the chromic acid radical) is not practiced in maintaining the efficiency thereof; and from claims 5, 6, 10, 13 and 15 any method of electrodepositing chromium in which regulating within the limits specified a radical component of the bath (other than or in addition to the chromic acid radical) is not practiced in maintaining the efficiency thereof. No disclaimer was filed as to claims 3 and 18 which are relied upon. They contain words of limitation to being "maintained" or "regulated" in "continuous deposition." By the disclaimer the claims are all limited to the step of maintaining the efficiency of the bath by regulating the radical component of the bath (other than or in addition to the chromic acid radical).

The defendant has offered proof of three alleged prior uses:

- I. The Bureau of Standards and the Bureau of Printing and Engraving in Washington, D. C.
- II. The Eastman Kodak Co., Rochester, N. Y.

III. The Westinghouse Electric & Manufacturing Co. at East Pittsburgh, Pa., and at its lamp works in Bloomfield, N. J.

But the Bureau of Standards did not practice the invention of the patent in suit prior to Fink. Only laboratory experiments were conducted by Eastman up to the time of Fink's date of invention, and prior use has not been proven in the Westinghouse works at East Pittsburgh or at Bloomfield.

In view of what has been said supra, all claims in suit are held valid and not inspired by the prior publications or by the prior art and not anticipated by the alleged prior uses.

We now come to the question of infringement. Defendant's process is described step by step in the Stipulation marked Exhibit T which is dated January 26, 1930. It is also described in defendant's answer to the interrogatory read into the record at page 42. Defendant admits in its brief that it practices the invention described, for example in claim 15 of the patent, and in addition thereto, withdraws a sample of the solution at intervals of approximately thirty (30) days and analyzes it. If any loss of sulphate radical is noted, it is made up by an additional amount supplied to the solution, thus, keeping the percentage of sulphate radical substantially constant. This being the case the defendant comes clearly within claim 15 as limited by the disclaimer filed June 20, 1928. The remaining claims in suit are similarly infringed. I therefore conclude that all claims in suit are valid and infringed by the defendant's process.

It follows, therefore, that there may be a decree for the plaintiff for an injunction, reference and accounting.

Submit decree accordingly.
Hartford, Connecticut,
October 20, 1931.

Note:—We are informed that an appeal will be taken from the above decision.—Ed.

Tinning Aluminum for Babbitting

Q.—We are occasionally called upon to babbitt aluminum automobile connecting rods and have great difficulty in making the babbitt metal stick to the aluminum. We would like to know if there is any method of tinning the rods before babbitting so that we can get a perfect bond.

We would also like to know what solution we can use for neutralizing a zinc chloride which we use in tinning steel connecting rods. We are most anxious to find something that would remove the acid from the rods after they have been babbitted.

A.—The aluminum rods may be tin plated in a solution made from

Sodium stannate	12 oz.
Sodium acetate	2 oz.
Caustic soda	2 oz.
Water	1 gal.

The aluminum rods should be cleaned in a mild alkaline cleaning solution, then rinsed in water and dipped in a 5% hydrofluoric acid pickle for a few seconds, then thoroughly rinsed in clean cold water and plated in the tin solution, using $2\frac{1}{2}$ to 3 volts, at room temperature. A

deposit of 3 to 5 minutes should be all that is required for your purpose.

To neutralize the zinc chloride which is used in tinning the steel rods, a solution made of sodium carbonate (washing soda) 4 ounces, water 1 gallon may be used successfully. The work should be left in this solution for 4 or 5 minutes then rinsed in hot water and dried.

OLIVER J. SIZELOVE.

Tarnished Sterling Silver

Q.—Kindly give us information as to what causes yellow tarnish on sterling silver finger rings; that is, after they have been washed and polished. In our wash we use fig soap and ammonia.

A.—We are unable to tell you what causes the yellow tarnish unless you send us a sample of the tarnished work. It may be due to the operator who does the washing, and it may be due to the soap.

In either case, if the work is run through a weak cyanide solution (sodium cyanide 6 ounces, water 1 gallon) before the drying operation, the yellow tarnish should be prevented.

OLIVER J. SIZELOVE.

The Oxy-Acetylene Welding of Copper and Aluminum and Some of Their Alloys

By FRANCIS A. WESTBROOK

Mechanical Engineer, New Canaan, Conn.

A Description of the Applications for Welding and Methods of Welding Various Alloys, Cast and Fabricated.—Conclusion*

ALUMINUM welding is not difficult; it merely involves a technique somewhat different from that used for steel. Aluminum does not show a visible red heat before melting. Unless care is used, it will melt suddenly and fall away without warning, especially if the metal is thin sheet.

Aluminum Sheet

Commercially pure aluminum and the aluminum-manganese alloy are generally used in sheet form. Welding rod made of commercially pure aluminum is best for such material.

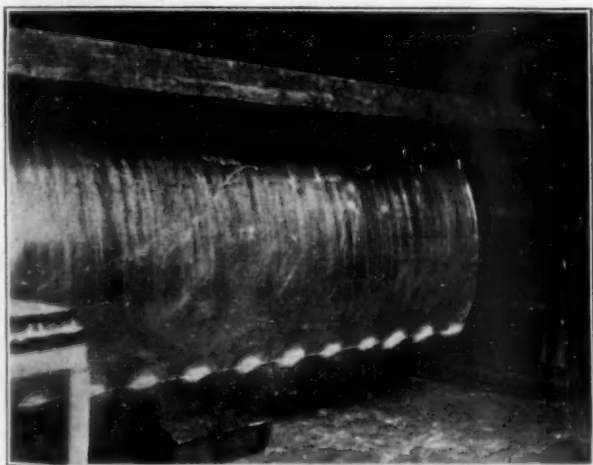


Fig. 9—Aluminum Sheet Notched and Tack-Welded.

A good grade of sheet aluminum flux should be used to remove oxide, which collects as a thick heavy skin and has a much higher melting point than the aluminum. Most aluminum fluxes are powders or thick pastes which can be thinned with water to a creamy consistency and applied to the welding rod by dipping. Or where welding rod is not used, the flux is applied to the edges of the weld.

Aluminum sheet of 16 gauge or lighter should be prepared for welding by flanging the edges, the height of the flange being equal to, or slightly greater than, the thickness of the sheet. The upstanding edges, painted with flux, are melted together. No rod need be used.

Plate $\frac{1}{8}$ in. to $\frac{1}{4}$ in. in thickness should be prepared for welding by cutting vertical notches, spaced $\frac{1}{4}$ in. apart, in the edges to be joined, Fig. 9. These notches distribute

the flux evenly over the surface, act as expansion joints, prevent local distortion, and lessen the possibility of melting holes in the sheet.

Where the thickness exceeds $\frac{1}{4}$ in., the edges should be beveled with a 90 degree vee. This should not extend through the whole thickness of the plate, but should stop about $\frac{1}{8}$ in. above the bottom. This $\frac{1}{8}$ in. lip is then notched. The surfaces to be welded, and all adjacent surfaces, should be cleaned carefully with a wire brush and gasoline. Plate $\frac{3}{8}$ in. in thickness or greater should be preheated before welding. If jigs are available, they should be used to hold the work, Fig. 10. Long seams should be tack-welded every 3 or 4 in. Spring clips can be used to hold light sheets in place; H-clamps are advisable for thicker pieces.

One of the most important points of difference between welding aluminum and steel is that aluminum must be welded much more rapidly. As the metal ahead of the blowpipe heats up, the speed of the welding must be increased. In beginning the weld, the two edges are melted first; then the rod is added. After that, the welding rod and both edges of the joint must be melted at the same time; unless they are evenly heated, the weld will not be smooth.

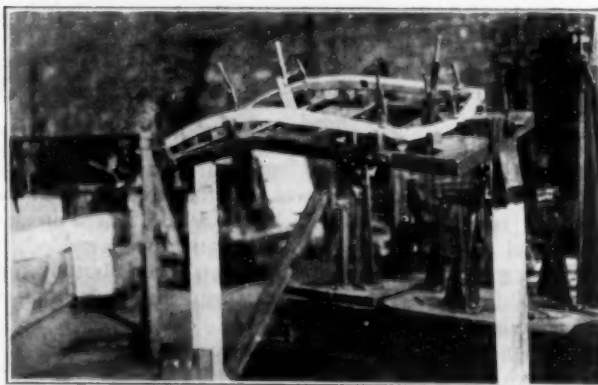


Fig. 10—Jigs Used to Support Aluminum for Welding.

The blowpipe should be held with the flame at an angle of about 30 deg. to the surface of the work but the inner cone should not be held too close to the surface. This method saves time because it keeps the metal hot ahead of the point of welding, yet it prevents the burning of holes in the sheet. If a welding rod is used, it should be held in a direct line with the weld and its tip kept in the flame near the metal. Metal from the welding rod should be thoroughly fused with the base metal at all times.

* Part 1 was published in our October issue.

When the welding is completed, the flux should be thoroughly washed off to prevent corrosion. In some cases, this may be done with a steam jet; in others, by immersion for 20 min. in either a 2 per cent nitric acid solution or a 10 per cent sulphuric acid solution. If the acid bath is employed, the work should first be scrubbed for 3 min. in hot water. A final rinsing bath is necessary to remove the acid.

Aluminum Castings

Aluminum castings usually are made of alloys containing copper, silicon, or zinc in varying percentages. The welding of castings requires as much care as does the welding of sheet. Whenever possible, the welding rod should be of the same composition as the casting. A different flux is necessary; and the blowpipe tip should be a size larger than that used for steel of the same thickness.

Wherever possible, the edges to be joined should be vee'd. In repairing defects in the surface of new castings, however, veeing is unnecessary.

The entire casting usually is preheated before welding. Great care should be taken to prevent overheating, which will cause the whole piece to collapse. Preheating must be done slowly and at the proper temperature. There are several ways in which the proper temperature for welding can be determined. For instance, if the casting is at the right temperature, a stick drawn across it will char and leave a black mark, or sawdust sprinkled on it will char. Also, a thoroughly heated casting gives off a dead sound when struck lightly, and it feels soft when scraped with a steel rod. When a casting is at the right temperature for welding, small beads appear on its surface; this is called **sweating**.

If the casting is small and the welding is not intricate, expert welders can eliminate the preheating operation. All that is necessary is to set the piece on a welding table and bring the edges to the proper temperature by moving the blowpipe flame back and forth about 1½ to 2 in. above the metal.

If the welding of castings is a regular production operation, a permanent preheating furnace should be installed. Otherwise, preheating may be done in a temporary furnace made of firebrick. Holes for the draft are left in the first course of brick, and regulation is secured by banking sand against them. The top of the furnace should be covered with asbestos paper which has holes punched in it for the draft.

The puddling method of welding is employed. The casting is heated until it reaches a pasty condition. Then, with a puddling rod (¼ steel rod flattened at both ends to form paddles 1 or 1½ in. long) a vee 2 or 3 in. long is scraped out. The welding rod can now be added, not by melting it in the puddle of molten metal, but by holding it in the flame near the metal and allowing it to run into the vee prepared for it.

When a puddle has formed, place the welding rod in it and work it around so that it fuses thoroughly with the bottom and sides of the vee. If the oxide formation becomes too heavy while the welding is in progress, remove it with the puddling rod. Since the oxide forms as quickly as the metal is exposed, it is useless to attempt to remove all of it from the top of the puddle. Reinforce the joint about ¼ in. When this section of the work is completed, proceed to the next 2 or 3 in. section and repeat the operation. The work should be allowed to cool slowly when the welding is finished. To insure slow cooling, cover the work with asbestos paper and allow as much time as is necessary.

The important thing to remember in this type of work

is to use a neutral flame. If a flame with an excess of oxygen is used, the oxide will form more quickly and interfere with welding.

Strong Aluminum Alloys

Although the strong aluminum alloys have the strength of steel, they weigh only about half as much. They are made according to various formulae, but their strength depends entirely upon very accurately controlled heat treatment. For instance, an alloy containing 92 per cent of aluminum, 4 per cent of copper, ½ per cent of magnesium, and ½ per cent of manganese is heat treated at 900 deg. F. and quenched in cold water. Cold working before or after heat treatment increases the strength of these alloys. During the first four or five days after treatment, strength and hardness increase until they equal that of steel. Because of their peculiar properties, these alloys present a special problem in welding.

In making joints in the strong alloys, simple joints must be used, provision for expansion and contraction must be made, and the finished welds may require heat-treatment.

For the most satisfactory results, welding rod should contain about 5 per cent of silicon. Rods of drawn metal of the same composition as the base can be used if allowance is made for expansion and contraction. This allowance is not necessary with the silicon alloy rod because its contraction is very slight while solidifying. It also has a lower melting point; hence, remaining molten after the base metal has solidified, it flows into the voids caused by contraction.

Since it is best to complete the entire work without interruption, an adequate supply of welding rod should be available. Preparation consists of carefully cleaning the work and coating it with flux.

After the weld has been completed, it is advisable to heat the whole part at a temperature of from 890 to 940 deg. F. The time of the heat treatment, dependent upon the size of the work, is from 15 min. to an hour. The piece can be quenched in water, oil, or air. Air quenching is least desirable because the metal loses much of its strength.

The strength of water- or oil-quenched welds in duralumin averages over 43,000 lb. per square in., while air-quenched welds average 40,000 lb. per sq. in. Welds not heat treated at all show a strength of only 25,000 or 30,000 lb. per sq. in. (Note: Alclad, a strong aluminum alloy coated with commercially pure aluminum, is welded in the same way as the strong alloys just discussed.)

Black Background on Nickel

Q.—What to your mind is the best and most economical method of making a lasting black background in depressed detail on polished nickel brass castings?

Any information you can give, as well as ingredients used and method of application, will be greatly appreciated, as we are figuring on a job coming up very soon.

A.—To produce a black background on a polished nickel surface, we would suggest that you use drop black (ground in japan) thinned with turpentine to proper consistency. This may be painted upon the work and left to set, and then relieved with a rag moistened with turpentine.

Another way would be to use a stencil and spray a black enamel upon the work. Some types of lacquer enamel do not adhere to a nickel surface very well, and it may be necessary to use a coat of priming lacquer before applying the black enamel.

OLIVER J. SIZELOVE.

British Institute of Metals Meeting

Synopses of Papers Presented at the Twenty-Fourth Annual Autumn Meeting Held in Zürich, Switzerland, September 13, 15, 1931, and Brief Summary of the Meeting.—Conclusion*

"Physico-Chemical Study of the Gold-Copper Solid Solutions," by Professor N. S. Kurnakow and N. W. Ageew.

In order to investigate the transformations in alloys of gold with copper, the method of determining the electrical resistance at high temperatures and recording it by means of Kurnakow's registering pyrometers was employed. Both annealed and quenched alloys were studied.

The existence of the compounds AuCu and AuCu₃ has been confirmed by constructing isothermal diagrams of the electrical resistance and the limits of the solid solutions have been indicated.

The nature of the formation and dissociation of both these compounds has been studied by the electrical resistance method, and the volume changes in the alloys have been determined.

"Physical Testing of Copper and Copper-Rich Alloys in the Form of Thin Strip," by Maurice Cook and Eustace C. Larke.

Tensile, hardness and cupping tests using various types of machines have been carried out on H. C. copper, 95:5 copper-zinc alloy, 70:30 and 64:36 brass, and 80:20 cupronickel in the form of strip 0.06, 0.04, 0.02, and 0.01 in. in thickness prepared in accordance with prevailing commercial practice. Each material at each of the four thicknesses was prepared and tested in four different tempers, varying from fully annealed to hard rolled, and the results are put forward as typical of those obtainable in the course of routine testing with machines in general use.

Consistent results for tensile strength and elongation are obtainable on all the materials down to and including 0.02 in. thickness. One of the most—if not the most—satisfactory methods of measuring hardness, especially having in mind the requirements of routine control testing laboratories, where the ease and rapidity with which tests can be carried out is a most important feature, is the diamond pyramid static indentation method. Cupping machines, although they may measure some kind of ductility and, if properly correlated, may afford a good sound indication of the behaviour of a material for cupping and drawing operations, are limited in respect of specification work because of the variability of results given by different machines.

"Experiments in Wire-Drawing. Part II.—Notes on the Relation Between Reduction of Area by Cold-Drawing and Tensile Strength of H.-C. Copper," by W. E. Alkins.

Annealed copper rod 0.435 inch diameter was drawn through straight-sided dies tapering at 5° at single drafts of slowly increasing amount. The resulting "primary" tensile strength reduction of area curve consists of an approximately rectilinear portion up to about 15 per cent reduction and of a smooth curve concave to the reduction axis from 15 per cent upwards. Below 15 per cent the results are consistent with the view that drawing takes

place by simple elongation under tensile stress. Above 15 per cent the curve has the form of a rectangular hyperbola and one asymptote appears to lie suggestively near the limiting tensile strength to which copper can be cold-drawn.

When reduction is effected by a series of successive drafts, the tensile strengths attained for any given reduction of the original area are lower the lighter the drafting.

The maximum reduction possible at a single draft from annealed rod under these conditions is about 56 per cent. Successive drafts of 50 per cent are not possible, but successive drafts with a reduction of 40 per cent at each pass can be effected.

"Brittleness in Copper," by Clement Blazey.

The experiments described in this paper are a continuation of those described in two other papers already published in this Journal under the title of "Brittleness in Arsenical-Copper." It has been found that the brittleness is not restricted to arsenical-copper, but may be produced in copper free from arsenic. The necessary conditions so far discovered appear to be thorough poling of the copper and the presence of a small quantity of bismuth. The investigation has not yet brought to light any element, other than bismuth, which can be regarded as a contributory cause of brittleness.

Brittleness is developed by cold-working the copper and annealing it in one of three ways, viz.:

- (a) By annealing below a certain critical temperature which is in the neighborhood of 650° C.
- (b) By slowly cooling it from above this critical temperature to any point below.
- (c) By quenching from above the critical temperature and reheating just below it.

When the copper is annealed above the critical temperature and quenched, it is quite free from brittleness.

Other points of interest are:

- (a) Metal which has been annealed just below the critical temperature, and quenched, is almost as brittle as metal which has been annealed several hundred degrees below it.
- (b) Metal which has first been annealed well above the critical temperature, quenched, and then reheated below that temperature, develops brittleness more slowly than does metal which has first been annealed just above that temperature, quenched, and then reheated below it.
- (c) In a series of alloys made from the one type of copper the critical temperature varies according to the bismuth and oxygen contents.
- (d) Fracture in brittle metal occurs along grain boundaries.
- (e) Annealing in air at a high temperature reduces the susceptibility to brittleness to a considerable degree, apparently on account of penetration of oxygen from the surface inwards.

So far brittleness has been produced in the following types of copper:

*Part 1 was published in our October issue.

(a) Commercial arsenical-copper containing phosphorus and appreciable quantities of other elements such as nickel, antimony, and lead.

(b) High-grade commercial arsenical-copper containing phosphorus and only very small quantities of other elements.

(c) High-conductivity (wire-bar) copper containing only very small quantities of elements other than copper and oxygen.

(d) Cathode copper produced by the Mount Lyell Mining and Railway Company, Ltd., Tasmania, and derived from copper ore mined in the Mount Lyell district.

(e) Cathode copper produced by the Electrolytic Refining and Smelting Company of Australia, Ltd., at Port Kembla, from ore which was practically all mined in the Cloncurry district, Queensland.

(f) Firebox plate obtained from an Australian State Railway Department. The plate was taken from a locomotive which was constructed in Great Britain and in all probability was made of copper of extra-Australian origin.

Experiments were carried out to test the influence of selenium. It was found that the intensity of brittleness was not increased when this element was present in relatively large quantities.

"The Attack on Mild Steel in Hot-Galvanizing," by Edward J. Daniels.

Experiments have been carried out in the laboratory to determine the rates of attack on mild steel strip when immersed in different brands of zinc (high-grade and G. O. B.) at various temperatures between 432° C. and 540° C. The influence of the addition of small percentages of aluminium, antimony, and tin has been investigated, and the action of alloys of zinc and cadmium has also been studied. A full discussion is given of the application of the results obtained to the problem of galvanizing kettles, and confirmatory data obtained by examination of an actual kettle are presented in support of the deductions arrived at from the laboratory experiments.

"The Oxidation of Some Copper Alloys," by John Stanley Dunn.

The zinc-copper alloys fall, as far as their behaviour under oxidation is concerned, into two classes, fairly sharply separated. Those with copper contents below about 80 per cent all oxidize at essentially the same rate, and all give rise to an oxide which is almost pure zinc oxide. Those with copper above about 86 per cent oxidize at approximately the same rate as copper, and the oxide contains the metal in the same proportion as the original metal. The first or zinc oxide forming class oxidize at about one-eighth of the rate of the second or copper oxide-forming class.

In all cases the oxide forms a protective coat limiting the rate of further attack, and it is shown that the form of the oxidation-time curves is consistent with this theory for the two classes mentioned. The alloys with copper contents between 80 and 86 per cent behave in a more complex manner, which is not susceptible to mathematical analysis.

The rate of oxidation increases exponentially with temperature, doubling itself approximately for every 75° C. rise in temperature.

The formation of zinc oxide only below 80 per cent copper is shown to be due to reduction of copper oxide by zinc diffusing up to the surface, and the change over to the more rapid oxidation with an oxide of high copper content is shown to occur in circumstances in which the amount of zinc reaching the surface is inadequate.

Chlorine compounds only have been found to accelerate the oxidation of brasses with a simultaneous increase in the copper content of the scale. Red staining on pickling is associated with this accelerated oxidation. Small quantities

of arsenic and nickel are without influence on the course of oxidation, but aluminium, even in such small proportions as 0.1 per cent has a marked protective effect, whilst 1.9 per cent of aluminium almost entirely inhibits oxidation at temperatures up to 800° C.

Three copper-silicon alloys were examined, and while the silicon confers some measure of protection at 725° C., at 827° this effect breaks down, and anomalously shaped oxidation velocity curves are found associated with oxide films containing practically no silica.

"The Copper-Magnesium Alloys. Part IV.—The Equilibrium Diagram," by W. R. D. Jones.

The equilibrium diagram of the alloys of magnesium and copper has been constructed from thermal and microscopic data. Magnesium and copper form solid solutions to a limited extent. At the ordinary temperature 0.02 per cent copper is soluble in magnesium and 2-2.2 per cent magnesium in copper. Two compounds Mg_2Cu and $MgCu_2$ exist which do not form solid solutions, but form eutectic series with each other and with the solid solutions of copper with magnesium, and of magnesium in copper. The compound $MgCu$ is not formed in the solid state. A review of previous work is given.

"Note on the Diameter Measurement of Certain Brinell Indentations in Cold-Rolled Metal," by Hugh O'Neill.

Owing to the shape of the lip of indentations made by the Brinell test in certain cold-worked metals, diameter measurements of the indent may differ by 3-4 per cent according to whether vertical or oblique illumination is used with the measuring microscope.

"The Work-Hardening Capacity and Elongation Properties of Copper," by Hugh O'Neill and J. W. Cuthbertson.

Various methods of obtaining the elongation values of tensile test-pieces have been applied to specimens of copper in the annealed and increasingly cold-rolled condition. Indentation tests which may be considered to estimate the work-hardening capacity have also been applied to the same specimens for purposes of comparison.

So far as they go, the results of this work indicate that (a) the Tetmajer "uniform elongation" value, and (b) the "extensibility," i.e. $(1 + a)$, where a is the index in the Bertella-Oliver elongation equation, are reliable measures of the work-hardening capacity of a metal. They present no difficulty in their determination being calculated from observations on an ordinary tensile test-piece with two, or preferably more, gauge lengths.

It also appears that the percentage elongation on a single-gauge length chosen so that

$$L < 15 \sqrt{A}$$

may be used as an index of strain-hardening capacity. These various elongation values should be reliable guides of the suitability of a metal for deep pressing operations.

"Melting Nickel-Chromium Alloys in Hydrogen," by C. J. Smithells, S. V. Williams and E. J. Grimwood.

The phenomena connected with the melting of nickel-chromium alloys in hydrogen have been studied. It is shown that sound ingots can be produced by this method provided that all the oxides present in the melt are reduced by hydrogen before casting. If any oxides remain in the melt, these are reduced by hydrogen, which is liberated at the moment of solidification, with the formation of steam, which causes blowholes. For casting in air it is necessary to displace the hydrogen with nitrogen before pouring.

The effect of using various grades of raw materials in the preparation of the alloys has been studied. Alloys prepared from commercial materials have been found to

give better resistance to oxidation than those prepared from pure materials. The probability that the presence of certain impurities has a beneficial effect was confirmed by making deliberate additions of elements known to be present as impurities in the raw materials.

The superiority of the nickel 70, chromium 20, and molybdenum 10 per cent alloy, referred to in a previous paper, was confirmed.

The process of hydrogen melting of nickel-chromium alloys is being applied on a commercial scale. The process has also been used with success for the preparation of other metals and alloys in a ductile state without the use of the usual deoxidizers.

"The Spectrographic Assay of Some Alloys of Lead," by D. M. Smith.

An account is given of the application of the spectrograph to the quantitative determination of low percentages of tin, antimony, and cadmium in lead alloys; a routine method is described specially applicable to the binary and ternary alloys of lead used in cable sheathing, etc.

The method is based on standards of known composition either synthetically prepared or determined by accurate chemical analysis. One of its great practical advantages is that it is very much more rapid than ordinary chemical assay of these metals. Spark spectra are pre-

ferred as giving more consistent results than arc spectra.

By simple direct comparison of spectra the constituents can be determined within the range 0.1—1 per cent, with an accuracy of 10 per cent (thus a percentage of 0.25 would be determined with certainty as being between 0.22 and 0.28 per cent), and by the application of the logarithmic sector method a similar accuracy for a range up to 3 per cent tin can be obtained.

"Transformations in the Gold-Copper Alloys," by John L. Haughton and Ronald J. M. Payne, with an Appendix on "X-Ray Examination of Gold-Copper Alloys," by G. D. Preston.

By recording autographically the variation resistance with changing temperature of alloys of composition ranging between 20 per cent and 70 per cent atomic of gold, and by measurements of the specific resistance of alloys slowly cooled to room temperature, the transformations in alloys with compositions in the neighborhood of those corresponding with the compounds AuCu and AuCu_3 have been confirmed, and the presence of another transformation in alloys approximating to the concentration of compound AuCu_8 has been established. The microstructure of the alloys has been studied, and a few alloys have been subjected to X-ray examination.

Research in Bronzes

Review of Published Results of Research Performed at Metallurgical Plants at Billancourt, France

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M. AMELINE, technical director of metallurgical works at Billancourt, near Paris, has just published the results of his researches into the influence of impurities in the quality of bronzes. An important conclusion for users of bronze and bronze manufactures is that tests should always be made on ingots, not on completed or half-manufactured products, as faults are concealed by the processes of manufacture and only become manifest later.

Antimony, if the percentage is not higher than 0.4, is not detrimental, rather increasing ultimate strength, elasticity and elongation. Up to 0.2 per cent antimony apparently acts as a purifier and a deoxidizer; above 0.4 and below 1.2 per cent strength and elongation are slightly reduced. Elasticity is improved by a content up to 0.8 per cent, and castings of bronze containing antimony showed no pitting. Up to 1 per cent of lead increases strength and elongation by nearly 0.5 per cent; but above 1 per cent strength and elongation diminish slowly until 4 per cent is reached, when the decline is rapid. Leaded bronze is always less elastic than the pure alloy.

Arsenic has a very contradictory influence. A bronze containing 1.5 per cent of arsenic gave an ultimate strength of about 343 pounds per square inch, but elongation was reduced by as much as 11 per cent. Elasticity is increased by the presence of arsenic up to 1.0 per cent, then lowered, but again increases at 1.5 per cent. Sonority

is also improved. Such bronzes are, however, easily attacked by acids.

Iron has a bad influence, particularly above 1.0 per cent, ultimate strength being reduced to approximately 270 pounds per square inch and elongation to 5 per cent. The fracture is crystalline and reddish in color. Sulphur also has a bad influence. There is a reduction of 10 per cent in ultimate strength for every 0.10 per cent of sulphur. On microscopical examination the fracture shows lozenge-shaped inclusions, with smooth surfaces and greyish in color.

A certain amount of foreign matter is introduced with scrap, chiefly silica and carborundum derived from the molds. As these impurities produce no bad effects there is no objection to the use of scrap.

In the course of his research M. Ameline found that temperature, both in melting and casting, was of great importance and should be modified according to the constitution of the alloy. With too low a temperature the castings are full of pittings, more numerous towards the surface; with too high a temperature the pittings are many but smaller. For bronze with 90 per cent of copper he found the most suitable temperature to be 2,192 deg. F. Better metals are produced when means are adopted to draw off gases from the furnaces, because these gases are quickly absorbed by the metal at high temperatures and castings from such metals are apt to be badly pitted.

Smelting Secondary Aluminum and Aluminum Alloys

By DR. ROBERT J. ANDERSON,

Consulting Metallurgical Engineer, Cleveland, Ohio

A Series of Articles on the Reclamation of All Forms of Scrap and Used Aluminum and Aluminum Alloys. Part 11—Metal Recoveries in Secondary Aluminum Practice.*

IN this article, the various factors affecting recoveries in re-melting aluminum and aluminum-alloy scraps are discussed, and the usual range of recoveries secured in practice is indicated. It may be said at the outset that the question of recovery is the crux of the secondary aluminum business, assuming that the scraps handled are bought at their actual worth as determined by market conditions and other governing factors. The prices that can be paid for scraps are dependent in large part on the recoveries which can be assured by the operating department of the secondary smelter. Obviously, if the practice in one plant is such that higher recoveries can be consistently obtained when running given grades of scrap, as contrasted with another plant, then the first plant is in a better position as regards scrap supplies and profits.

While practice in handling the different scraps by secondary smelters is now fairly well standardized, at the same time some smelters report consistently higher recoveries than others on carload shipments sold on a recovery basis. Differences in recoveries on given grades of scrap are to be attributed in large part to variations in methods of pre-treatment, furnacing and fluxing, and skill of furnace hands. Of course, the recoveries obtained in re-melting the various kinds of scraps vary widely, depending in the main on the character of the material. While the practice is not common, it is preferable in the writer's opinion, to sell scrap on the recovery basis, since the smelter capable of obtaining the highest recoveries can pay the highest prices, other things being equal. The average vendor of scrap may not actually know what his material is worth, except insofar as he is guided by current market conditions, but secondary smelters know from past experience with the majority of scraps offered (and considering their sources) about what price can be paid for them. Large sums of money have been made by knowledge of the relation of metal recoveries to scrap values. At the present time, in secondary aluminum work, drosses and borings are sometimes sold on a recovery basis but the other kinds of scrap are infrequently so sold.

Recoveries may be based on the total net weight of lots of scrap or on the actual metal (aluminum or aluminum-alloy) content. Thus, in the case of fairly clean but oily borings, containing say 10 per cent volatile (oil and water) matter, the recovery of metal based on the true metallic content may amount to 90 per cent, but this recovery based on the metal plus oil would amount to only 81 per cent (*cf.* Effect of Pre-Treatment on Recovery, below). Where the true metallic content in scrap and wastes is

likely to be subject to considerable variation, as in borings and drosses, it is common practice to buy on the basis of a sample which is supposed to be representative of a given lot.

Effect of the General Character of the Scrap on Recoveries

The various kinds of scraps that are available to the secondary smelter have been discussed in a previous article in this series. Speaking generally, the heavier and cleaner the scrap, the higher the recovery possible on re-melting. Thus, the melting loss with large, clean, heavy castings should be but little, if any, more than with pig; on the other hand, the recovery with paraffin-coated paper-backed foil will be almost *nil*.

Pre-treatment methods for the cleaning of dirty scraps and the conditioning of drosses and borings, as developed in recent years, have, of course, raised the possible recoveries very appreciably over those obtained previously. Thus, whereas an ordinary re-melting of un-treated dross containing 50 per cent free metal might yield 30 per cent metal or less, when such a dross is crushed and screened the recovery may be about 45 per cent. The percentages 30 and 45 refer to the total weight of the dross. When based on the free metal available, the percentages are 60 and 90, respectively. In the same way, the recovery on dirty, oil-soaked borings may be 50 to 60 per cent based on the total weight, if run without pre-treatment, but around 85 per cent if first dried before re-melting. Any pre-treatment naturally entails expense, so that scraps requiring cleaning, magnetting, grinding, sorting, or other similar handling before furnacing do not command the prices of corresponding clean scraps.

Dry, clean borings of given size yield higher recovery than do wet or oily borings, even if the latter have been pre-treated by drying methods. The size of the chips arising in machining operations affects the recovery possible, large, thick borings giving higher yields than fine, thin pieces. Painted sheet naturally gives much lower recovery than clean old sheet free from paint, dirt, lacquer, or other foreign matter. Drosses vary greatly in grade and character. In many plants, in melting aluminum and its alloys, zinc chloride is sprinkled on the surface of the liquid bath before skimming. The effect of zinc chloride is to break up the scum on the bath, free the oxide from entangled metal, and yield a dry powdery dross. The bulk of the entangled metal in the dross is pulled off with the skimming tool. In some plants, the skimming is much richer than in others. In most foundries, some attempt is made to pick out free metal from furnace skimmings, thereby reducing the grade of

*Parts 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 were published in our issues of January, 1925; September, 1925; February, 1926; May, 1926; November, 1926; July, 1927; November, 1927; August, 1928; October, 1929; November, 1930, and December, 1930, respectively.

the dross. In some foundries, drosses, floor sweepings, grindings, and other scraps originating in the plants may be run down in a recovery department. The drosses arising from re-melting these scraps are usually offered to secondary smelters. Generally, the grade of such drosses is very poor.

Both grindings and foils are poor scraps from the point of view of recoveries. This follows because they are in the form of light, fine pieces and also because they are generally contaminated with foreign matter. Steel-cored cable presents a special problem as regards removal of the steel core wire. Such cable may be sold at a given price per pound for the aluminum only, on the basis that a certain percentage of the total weight is steel wire. The recovery obtained depends in part upon the method used in removing the core.

To summarize then, the recoveries obtainable from scraps and wastes are to a large extent governed by the general character of the materials, heavy and clean scraps having greater value from the point of view of recovery than light and dirty scraps. Of course, the composition of the materials is also an important factor.

Effect of Pre-Treatment on Recovery

As has been pointed out in a previous article, few scraps today are furnace by the secondary aluminum smelter without some kind of treatment first being applied. The chief pre-treatment methods used in practice include sorting, cleaning, magnetizing, baling, grinding, screening, and drying.

Taking the case of a carload shipment of so-called "mixed aluminum scrap"; such a consignment may contain proportions of painted sheet, old utensils, dirty and greasy crankcases with steel studs and bearings, old pistons, miscellaneous sand-cast parts, high-iron die castings, and possibly some foil. The car may be purchased at a given price per pound of net weight with up to 1 per cent foreign metals or materials allowable or not. Such mixed scrap must normally be sorted. In the operation of sorting, the several kinds of scrap are picked out and weighed; the material so separated may be dumped into bins with like scraps. The painted sheet may be tested to determine whether it is 99+ per cent aluminum, or an alloy. The same applies to the utensils. Segregation may be made if necessary or desirable. Castings may be sorted into separate lots, according to composition as experience may indicate.

In cleaning scrap, dirt and oil may be washed off from crankcases and other automotive castings, and foreign metals and alloys removed if convenient. As indicated above, the cleaner the scrap charged into the furnace, the better will be the recovery. Hence, it is advisable in most cases to remove grease, dirt, oil, stones, wood, paper, foreign metals, etc., before charging.

Taking a carload of oily borings; if this scrap were furnace directly without pre-treatment, the recovery would be poor. However, if the oil or cutting solution used in the machining operations which produced the borings is first removed, the recovery will be substantially higher.

A usual pre-treatment for oily borings consists in charging them into a rotary drying oven to burn off the oil, followed by running over a magnetic separator to remove any admixed iron or steel chips. In some plants of origin, it is practice to collect borings from the machine tools in containers having false or screen bottoms which allow much of the oil to drain off, followed by storage in large bins heated with steam pipes. Warming the oily borings causes the oil to become thinner and hence more readily drain off. There are good possibilities in

the briquetting of borings, but so far not much has been accomplished in this direction.

It has been pointed out above that if ordinary dross were furnace without prior treatment the recovery would be low. Hence, it is standard practice to crush or grind drosses in a suitable mill so as to jar loose and comminute the oxide, and then make separation of the great bulk of the free metal and the oxide by screening. Suitable equipment for this purpose consists of a Hardinge ball mill for the grinding and a Hummer, or other vibrating, screen for the screening. The screen mesh depends upon the amount of metal which it may be considered economical to pass to the fines. In some cases, this is contingent solely upon the practical recovery limit as determined by grinding costs and furnace experience, while in others it is dependent upon the use to which the fines are put. Thus, in using dross fines for the preparation of aluminum salts, one salt maker specifies that the fines shall contain a definite minimum percentage of free metallic aluminum. Speaking generally, very fine screening is not desirable from the point of view of recovery on re-melting because such screening merely introduces a quantity of minute metal particles into the bulk of the metallics. The normal recovery on such small particles is low, and their presence in a mixture of much larger particles may reduce the yield rather than increase it.

Light scrap, like old utensils, spinings, thin sheet, clean foil, etc., should not be charged into a furnace in the loose condition. Preferably, such scraps should first be bundled or cabbaged in a hydraulic baler to form a hard compact bale. Such a bale may weigh 35 to 100 pounds. Bales so made, if of clean scrap, are almost equivalent to heavy melting stock as regards oxidation losses on melting. Losses with loose scrap are prone to be serious.

Effect of the Furnacing on Recovery

Given the various scraps, adequately cleaned or otherwise pre-treated and ready for re-melting, recovery on a given grade depends very considerably on the operation of melting and the furnace technique. Oxidation is naturally to be avoided, particularly with light scraps, borings, and dross metallics. In secondary aluminum practice, the aim is to hold oxidation losses as low as possible, and various methods have been devised with this object in view. Skill in puddling and general furnace operation is developed only by experience, so that a trained crew of furnace hands is essential for satisfactory operation.

While satisfactory recoveries on various kinds of scraps may be made in crucible, iron-pot, or other furnaces which are of small capacity, present practice demands re-melting in large tonnages. Hence, the stationary open-flame furnace having capacity of 10,000 to upwards of 50,000 pounds is favored, and the bulk of the secondary output today is run in this type of furnace. The small open-flame furnaces having burners which blast down upon the bath are not generally regarded as well adapted for secondary re-melting. Crucible and iron-pot furnaces are awkward to operate.

On the basis that scrap re-melting will be done in the stationary hearth-type furnace, the question of operation may be considered briefly. In running this furnace, particularly in some operations, control of the furnace atmosphere as well as that of the temperature is difficult because of the necessity for opening the large doors of the furnace fairly frequently. While oil, gas, coal, and coke are all employed as fuel with this furnace, it appears that the most satisfactory furnace atmosphere is provided by coke. In any case, the firing should be so conducted that a large

excess of free oxygen in the furnace will be avoided. Data accumulated in running various grades of scrap with the four fuels above mentioned indicate that better quality of metal and higher recoveries are obtainable with coke.

Referring now to the furnacing operations in running the various kinds of scrap, the usual practice employed is as follows: In the case of old castings, crankcases, and heavy scrap in general, as well as baled material, the scrap is simply charged into a hot empty furnace until a sufficient quantity has been put in. This is melted down and then additional scrap is added from time to time until the furnace is full. When additional scrap is charged it is pushed and poked down into the bath. The normal scum of aluminum oxide which forms on the surface of the bath acts as an effective protection against further oxidation. The bath may be fluxed or de-gassed, as required, and skimmed before pouring.

In running borings, there are two main methods in use, viz., (1) the pasty process, and (2) the liquid (molten) flux process. In the pasty method, properly prepared borings are charged to a small furnace, usually a stationary iron pot, and mixed with a small percentage of a volatile flux (zinc chloride). The temperature is held near the melting point of the borings, and the mass is worked and poked with a tool from time to time as heating progresses, until a pasty ball is formed. More borings are charged periodically if necessary. When the pot is full of a pasty "mush," the temperature is raised to liquefy the mass, whereupon it is fluxed well with a volatile flux and then poured off into pigs. In the liquid flux process, a liquid heel of aluminum alloy is prepared in the

furnace (the stationary open-flame hearth-type furnace) by first melting a quantity of pig or heavy scrap. Suitable flux which will be liquid at the smelting temperature (under about 1,500° F.) is charged so as to cover the heel and form a blanket. Such fluxes may consist of mixtures of sodium chloride, fluorspar, cryolite, and other salts. The borings are then shoveled into the furnace and puddled through the flux cover into the heel. This process is continued until the furnace is sufficiently full of metal. Puddling beneath a flux cover prevents oxidation of the small individual pieces, and if any film of oxide does form, the mechanical action of puddling breaks up the film and causes coalescence. The metal is tapped off and poured into pigs; the flux cover is also tapped off and run to waste. Mechanical puddling has been applied in running borings, e.g., with the pasty process in small stationary iron-pot furnaces.

The above methods as described for use with borings are also applied to the re-melting of so-called metallics derived from crushing and screening drosses.

While there may not be much choice between the pasty and the liquid flux methods as regards recovery, the former is not well adapted to large tonnage production.

While details of fluxing methods and flux compositions cannot be taken up here, it may be said that the liquid flux cover should not become too viscous since otherwise considerable shotted metal will be retained by it and lost. Flux compositions are, largely, matters of private information, different mixtures being preferred by different smelters.

This series will be continued in an early issue.—Ed.

Metal Cleaning

Q.—In reading over the article entitled "Metal Cleaning," which starts on page 3 of your 1931 edition of *Platers' Guidebook*, we have thought that we should call your attention to certain things with which we do not entirely agree.

In the fifth paragraph of this article the writer makes the statement that mineral oils are not readily removed by alkalis, and further elaborates on this statement by saying that they are not saponifiable. It is true that mineral oils are not saponified by alkalis. There happens to be a slight difference in the action of alkalis upon mineral oils compared with their action upon vegetable oils. Mineral oils are emulsified by alkali cleaners, and the fact remains that by the process of emulsification, mineral oils are readily removed by alkalis.

It is our understanding that gasoline, benzine, etc., are not used to any appreciable extent, and certainly not in any of the large plants for the removal of mineral oils.

In the next paragraph of this article the writer refers to alkaline compounds as "solvents," which is a rather incorrect term in this connection.

In calling this matter to your attention we have no desire to seem too critical. As a matter of fact, the last part of this same article is extremely fine from our point of view. The part we refer to is that in which the writer mentions the fact that manufacturers of trade-marked metal cleaners have field representatives who are entirely capable of consulting with the manufacturer on special cleaning problems. This particular service is one of which this company is especially proud, and we are certainly glad your editor saw fit to write along these lines.

A.—Criticism of a constructive nature is at all times welcome by the author upon any of his articles. While it is not expected that every one will agree entirely upon each and every method, the writer endeavors to give his personal opinion, whatever it may be.

The article referred to was not written in a technical way, but in such a manner that it might be of some assistance to those without any technical training. In reference to the use of hydrocarbons for cleaning, the writer knows of one large plant in the city of Detroit where a hydrocarbon is used in conjunction with their cleaning methods, and it has proved of great assistance in their particular class of work. The writer has also used a hydrocarbon on a special job of cleaning, with results that were entirely satisfactory.

In the article referred to no formula was given for preparing a cleaning solution, believing that the best and probably the cheapest way in the end was to advise the use of prepared cleaners that have proved their worth.

OLIVER J. SIZELOVE.

Correction

In the article "Chromium Plating's Largest Field Is Industrial" which appeared on page 430 of the October issue, there were several typographical errors which should be corrected as follows: Page 430, eleventh line from bottom of left column should read "centigrade is .0000087"; page 431, paragraph (6), line 2, should read "Permitted use of soft surface steel without galling"; paragraph (24), line 2, should read "Increased service, eliminated discoloring of product"; paragraph (35) should read "Dies for Forging Tools . . ." etc.

Deep Etching of Brass Applied to Gating Problems

By R. W. PARSONS

Metallurgist, Ohio Brass Company, Mansfield, Ohio

Deep Etching of Brass Castings Is Shown As Applied to Determination of the Best Method for Gating Castings. Defects on Original Gating Are Shown. Causes of Leaks Resulting in Defective Globe-valve Castings Were Investigated by Deep Etching. Re-Gating Reduced the Losses to a Minimum. Limits to the Application of Deep-Etch Testing Are Given.

A PAPER READ AT THE MEETING OF THE AMERICAN
FOUNDRYMEN'S ASSOCIATION, CHICAGO, ILL., MAY 4-7, 1931.

LAST year, at the convention in Cleveland, a paper was presented regarding the application of the deep-etch test to brass.¹ The method was given in detail with numerous illustrations outlining the several applications for this type of examination. The object of this second paper is to present briefly a few specific instances wherein the test has been successfully employed as an aid to establishing satisfactory gating.

Deep etching of brass is accomplished by subjecting the specimen, often rough ground to eliminate saw marks and present a fairly smooth surface, to the action of concentrated commercial nitric acid for a period of seven to eight minutes—depending upon the size of the piece and the amount of acid used in relation to the surface of the specimen. For etching brasses containing tin, 10 per cent of commercial hydrochloric acid usually is added to keep the tin oxide in solution.

Development of a Tensile Bar Gating

Some few years ago a considerable number of tensile test bars were required to investigate the effect of corrosion on the physical properties of various alloys subjected to the action of locomotive smoke.² In this connection it was desirable that all specimens be cast from the same ladle of metal so as to introduce as few variables as possible.

With the standard A. S. T. M. tensile bar, which required about 10 lbs. of metal to produce one specimen, several heats and a multitude of molds would have been necessary for the number of bars desired. In order to simplify the molding and melting, a gating was developed, without recourse to the etch test, which gave three bars per mold and sufficient molds to the ladle so that the entire lot of a given composition could be poured from one small heat.

The layout of this gating is shown by the sketch of Fig. 1. The mold was poured uphill at about seven degrees to the horizontal.

After this gating had served the purpose for which it was developed, it was adopted for routine checking, inasmuch as it offered several advantages, namely, three bars instead of one from a somewhat smaller quantity of metal, no cores needed, and less machining required to prepare a specimen for test. The center bar was removed later when it was felt that duplicate bars would be sufficient for regular testing.

The physical properties obtained from the above tensile specimens compared favorably with those from the A. S. T. M. bar, but it soon became apparent that something was amiss. Depending upon where the bars fractured with respect to the center of the gage length, porosity was in evidence or the fractures were sound, as the case might be.

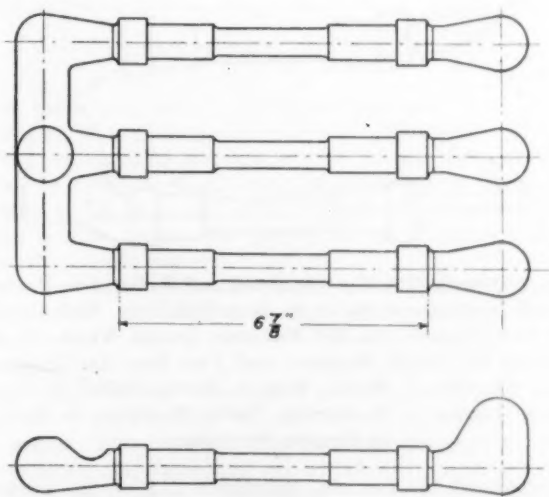


Fig. 1—Multiple Gating for Production of Brass Tensile Specimens. Consisted of Wooden Pattern Mounted on Mahogany Board. Molds Made in 9 by 14 Inch Snap Flask and Poured Uphill at About Seven Degrees to Horizontal. Over-All Length of Specimen Greater Than A. S. T. M. Bar and Considerably Less Machining Required Since Ends Were Cast to Fit Holders of Tensile Machine.

¹ Deep-Etch Test of Brass, by W. F. Graham and L. A. Meisse. A. F. A. Transactions and Bulletin, Feb., 1931, p. 310.

² "Corrosion of Alloys Subjected to the Action of Locomotive Smoke," by F. L. Wolf. A. I. M. E. Technical Publication No. 293, Class E, Institute of Metals, No. 104.

Defects were revealed by etching the section (Fig. 2-A), although the pronounced shrinkage cavity was visible before etching (Fig. 2-B). This information could have been obtained from fractures as well, but a whole series

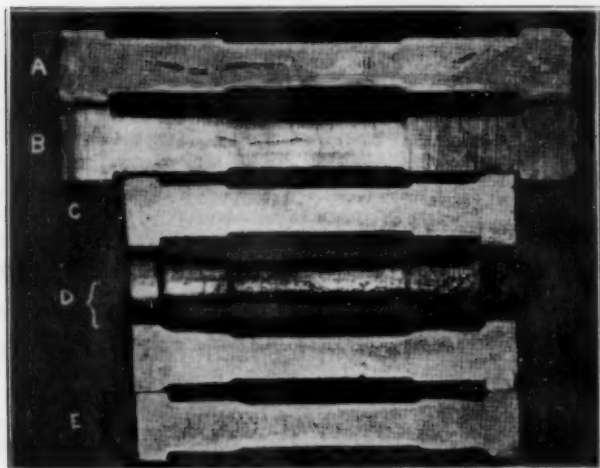


Fig. 2—Etched Sections of Tensile Bars Produced from Various Gatings. Gated Ends Are at Right in All Cases.

would have been required to furnish equivalent information.

The gated end was identified by marking the pattern with a stencil. Several changes were made in an effort to eliminate the shrinkage at the end of the gage length—larger risers, poured uphill, downhill, and *ad infinitum*.

Working on the assumption that for a given cross-section there is some definite limit to the length that can

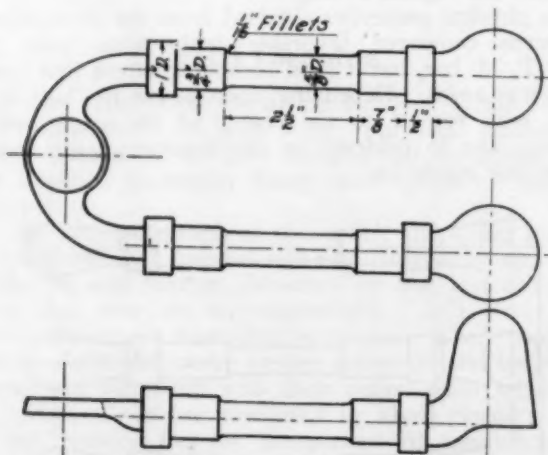


Fig. 3—Tensile Test Bar Shortened and Re-Gated to Produce Sound Specimens as Shown by Deep-Etch Test. Ends Outside the Gage Length Are the Minimum Length Which Fit the Holders of Tensile Machine, and Two Bars Are Produced from 4 1/2 Lbs. of Metal. Mold Is Poured Uphill at About Seven Degrees to Horizontal. Little Machining Is Needed to Prepare Specimens.

be cast sound, the bar was shortened to give the minimum length, outside the gage length, which would fit the holders of the tensile machine. With the shorter bar and a layout quite similar to the first tensile bar gating (Fig. 1), a sound specimen was obtained (Fig. 2-C).

In this second gating (Fig. 3), the risers were set closer to the ends of the bars and the gates were considerably smaller—less than five pounds of metal were required to pour one mold and produce two bars. The

uphill pouring gave a cleaner surface than was obtained by pouring downhill with the risers next the sprue, although both methods gave equally sound castings as shown by the deep etch.

Pouring the bar level, with the sprue acting as the only feeder, served satisfactorily as far as soundness of the etched section was concerned (Fig. 2-D), but with this method the gate had to be left wide open and the bars were so dirty that they had to be machined undersize. With the test bar cast parallel to a runner on which two risers were placed so as to feed into the sides of the collars at the ends of the bar, the feeding was not satisfactory (Fig. 2-E).

The pouring temperature is, of course, important in the same way that each job in the foundry has its own

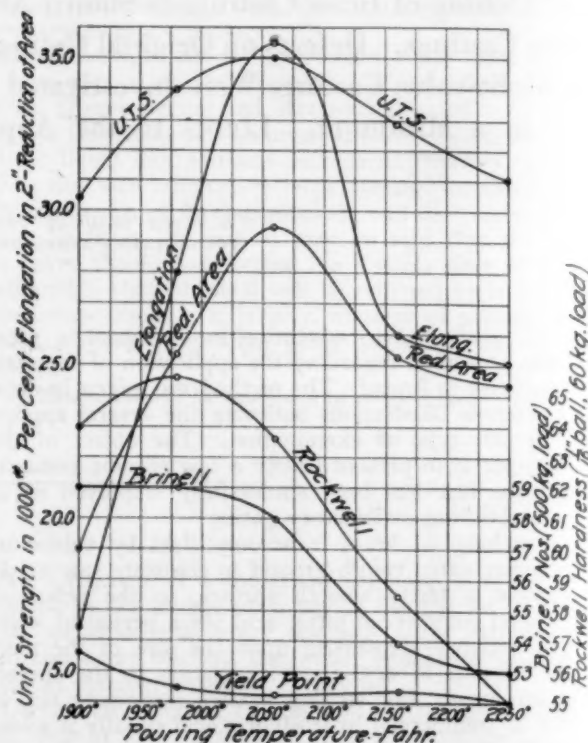


Fig. 4—Showing Effect of Pouring Temperature on Physical Properties of Alloy Containing Copper 84.64 Per Cent, Tin 3.38, Lead 3.14, Zinc 8.84. Tensile Specimen Used in Fig. 3 and Curves Show Optimum Pouring Temperature to Be 2060 Degs. Fahr. for the Gating and Alloy.

proper pouring temperature. The chart of Fig. 4, plotted from five points, shows how the physical properties vary with pouring temperature with the second tensile bar gating (Fig. 3). The same alloy and a fixed pouring temperature were used in all experiments with the gating of test pieces.

Improvement of an Impact Bar

Etched sections (Fig. 5), from a mold (12 castings) of Izod impact specimens of the three notch type, show that the risers are not adequate to properly feed the castings. The surfaces of the castings were usually rather dirty, so no attempt was made to increase the size of the gates in the above.

Again working on the theory that there is a limit to the length which can be cast sound with a given cross-section, a mold was stopped off so that the castings were shortened to the length of a single-notch Izod specimen. An improvement was brought about by decreasing the

length, but the etched specimens still showed considerable porosity.

Since 12 specimens were many more than were needed for the usual tests, a gating of four pieces was made, similar to the second tensile bar gating (Fig. 3), and poured uphill as before. With the gates sufficiently thin,

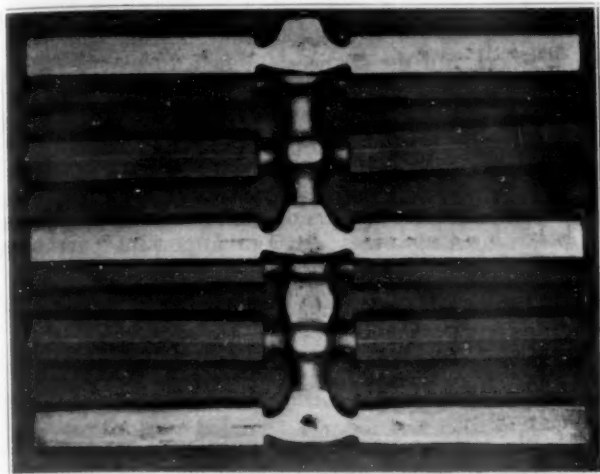


Fig. 5—Showing Portion of the Original Gating of 12 Izod Impact Specimens. Alternate Pairs of Bars Are Etched to Reveal Defects. The Sprue Which Was at the Bottom, and the Pair of Bars Next the Sprue, Are Not Shown.

so that the casting did not feed back into the gate, good results were obtained (Fig. 6-A), while with a thicker gate (Fig. 6-B) the casting fed back into the gate.

The risers of the tensile and impact bars (Fig. 6, A and B) do not show a pronounced shrinkage cavity because, to obtain the maximum physical values, the pouring temperatures are low. The fact that these are "dead" risers also has considerable influence since some

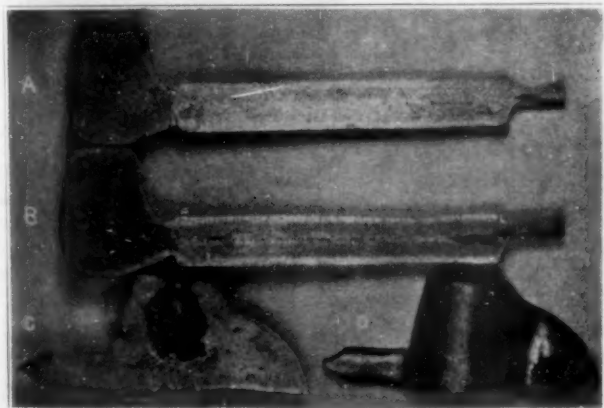


Fig. 6—Etched Sections of Izod Impact Bars, Showing Improvement in Structure Obtained After Re-Gating. In C and D, Etched Section and Outside Contour of a Riser Which Functions Efficiently Are Shown.

"pipe" would be developed, even at the low temperature, if the risers were next the sprue. At higher temperatures, the risers on both types of test bars (Figs. 3 and 6) develop moderate shrinkage cavities.

A riser which exhibits a large shrinkage cavity is shown in Fig. 6, C and D. Incidentally, this is of the same alloy and poured at practically the same temperature as the test bars. It is interesting to note to what

extent the "hot spot" inclines to the right (Fig. 6-C), which is in the direction of feeding.

Leak Losses Reduced by Re-Gating

A globe-valve body with a drain cock attached (Fig. 7, A and B) illustrates an application of greater interest to foundrymen than the production of test bars. These castings were produced on a Berkshire machine where both cope and drag were made from a single plate. This necessitated a rollover of the drag side so that the drains on one side of the center runner were in the cope (Fig. 7-A) and those on the opposite side of the runner in the drag side of the mold (Fig. 7-B).

It will be seen that, with the drain in the drag (Fig. 7-B), the adjacent thin section has partially fed the drain, leaving a considerable area of shrinkage, and it was found that in 80 per cent of the leakers the drains had

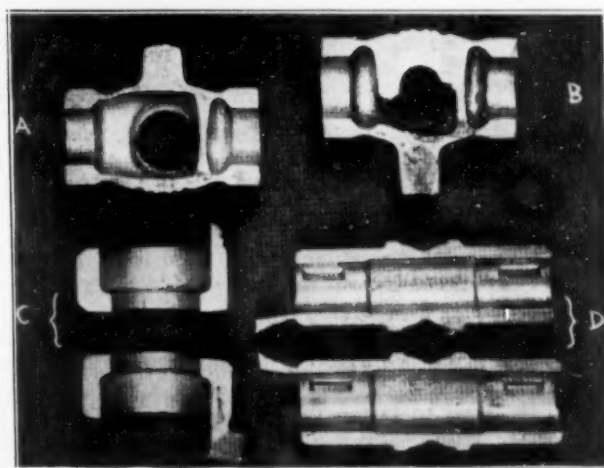


Fig. 7—Showing Influence of Gating on Soundness of Small Globe-Valve Body. Gate Is Toward Center in Each Case. C and D Illustrate Distribution of Defects in Dissimilar Castings.

been cast in this position. Regating this pattern with all the drains in the cope reduced the average leak losses from 5 per cent to 1 per cent.

Limits to Application of the Test

In connection with examination of light brass castings, it might be well to point out that gating is such a vital factor as regards the quality of etched sections that it often is difficult to discern any connection between the results of the etch and other factors which may be under investigation, unless the gating be kept constant through use of a single pattern.

As an example of the above, it was found that etched sections of dissimilar castings, one casting from each heat, taken over a period of weeks, showed that the samples from certain patterns were good with few exceptions, while those from other patterns were poor regardless of the character of the material charged into the furnace. This condition held even though the castings were from the same heat of metal.

Thus, whatever information existed regarding metal conditions—such as comparisons of ingot quality, furnace practice, or ingot vs. prime metals—this information was obscured by the lack of uniformity in the character of the specimens.

Etched sections from two different patterns, which were poured in succession from the same ladle of metal and

sectioned through the gate in both cases, show different distribution of shrinkage and variance in quality as shown by the etch test (Fig. 7, C and D).

One casting (Fig. 7-C) shows a shrinkage cavity localized at the gate and exhibits an excellent surface throughout the remainder of the section, while in the other casting (Fig. 7-D) the shrinkage is pretty well distributed around the circumference. Thus, sections made at random through these particular castings would create the impression that the former, with the localized defect (Fig. 7-C), was the better metal.

Conclusions

It has been attempted to illustrate, by relating several instances, that the deep-etch test can be useful in connection with problems of gating which have to do with the production of sound castings. Such phases of gating as

elimination of dirty surface and excessive mis-runs, of course, require other methods of attack.

In collecting information on the internal soundness of red-brass castings, the deep-etch test offers certain advantages over the older method of merely fracturing the piece, in that sections can be made longitudinally and through heavy sections which would be difficult to fracture. A clearer and more complete picture of the condition is obtained through the greater portion subjected to examination, and the chances for detection of defects are somewhat greater with the etched sections.

As is true of any valuable tool, it is apparent that there are certain limits to be placed on the application of the deep-etch test to foundry problems in general. It is practically impossible to draw any conclusions as regards metal conditions from etched sections of dissimilar castings, since gating plays such an important part in determining the quality which the etch test reveals.

Experimental Plating Cell

By T. F. HAWLEY

Department of Chemistry, Vanderbilt University

AN experimental plating cell of simple construction can be easily made in the following manner. Three pieces of poplar board $\frac{3}{4}$ in. thick and 5 in. by 5 in. in area are joined together as per the cross-section diagram, Fig. 1. Before joining, the joints are coated thoroughly with paraffin and ceresin to insure against leakage. Screws are used to fasten these three boards together at the mortised joints. Then the whole is immersed in boiling paraffin for $1\frac{1}{2}$ hours, using a pressure cooker. Upon removal the ends of the three boards are sanded thoroughly to provide perfectly square ends. The ends are then coated thinly with paraffin. Additional firmness is gained by securing a narrow strip of wood across the top of the box.

Gaskets made of good grade rubber are inserted between the copper or copper and platinum plates and the ends of the cell. End boards of the same material as the sides are strengthened by metal strips inserted in each. A large sized clamp completes the equipment, holding the end pieces in place, Fig. 2.

A cell of such construction has the advantages of imperviousness to attack by cyanides, plating solutions, etc. It can be made in any desired size, for any given capacity. Temperature has no effect on it, and the difficulty of coat-

ing plates with material which is resistant to solutions and temperature is avoided. The plates are held securely in place for potential measurements.

The purpose of the cell is to act as a preliminary to regular plating procedure. It will act as a guide in con-

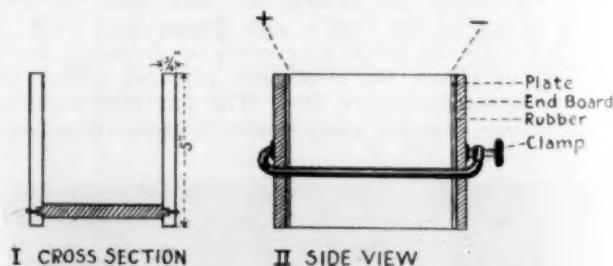


Diagram of Experimental Electrotyping Cell.

trolling such important things as proper current density, strength of solution, effect of temperature, etc. It can also be used for research on control methods. A study of the plates (copper or platinum) after a specified length of run, will indicate the nature of the deposit under stated conditions of the run.

Finishing Ash Trays

Q.—We are desirous of securing a finish for a stamped ash tray, sample of which we are enclosing; so as to give it a tone and rich finish. This finish must resist the heat of a cigar or a cigarette, and the work must be done as cheaply as possible in mass production. We do not intend to do any polishing on this ash tray as an operation of this nature is very costly.

In the course of your experience you have undoubtedly had a request for various types of finishes and it is possible that we can use one of them.

We would appreciate your giving us all the details of the finishes which you believe might serve our purpose.

A.—We know of no chemical finish that can be applied to the article that will withstand the heat of a cigar or cigarette. All chemical finishes are dependent upon a film of lacquer to preserve them, and all cellulose lacquers will mar or discolor when in contact with the heat of a cigar or cigarette. Bakelite lacquer resists this action very well, and its use is suggested.

As to the finish, a very pleasing cheap finish can be produced in an arsenic and cyanide dip. This dip is made of white arsenic 2 ounces, sodium cyanide 8 ounces, water 1 gallon. Use boiling hot.

The high part of the article may be relieved with wet pumice and a rag wheel, leaving the background black.

OLIVER J. SIZELOVE.

Flying Would Be Impossible Without Metals

By G. E. EVERETT

United Air Lines, La Salle-Wacker Bldg., Chicago, Ill.

Non-Ferrous Metals Are Vital To Airplane Construction, Beacon Lights, Radio Communication and Other Essential Departments of the Flying Industry

BEHIND the history of man's eternal desire to fly and particularly behind the more recent history of commercial aviation as one of the nation's transportation assets lies a story of metallurgical research and development. Brass, copper, bronze, and platinum and their alloys today go into the modern transport plane to make it a flying testimonial to the ingenuity of the metallurgist.

The big transport plane takes off for its 31-hour flight from coast to coast with mail, passenger and express. Passengers seated in a spacious cabin recline in chairs made of aluminum; the Wasp motors of 425 horsepower transmit their power to whirling propellers of aluminum; the wings, fuselage, tail surfaces and other control surfaces are of a metal called Duralumin, an alloy of alu-

minum, and forward in the pilot's cockpit the pilot adjusts to his ears radiophones that he may hear broadcast from the ground weather reports, plane dispatching reports and maintain a continuous conversation with the ground. His voice is carried by radio waves which get their original impetus from an instrument composed of brass and copper units.

two decades since the air mail service was started, is in the amount of flying, both with mail and passengers, which is done at night. United Air Lines, whose transport planes carry mail and passengers, flies more than 12,000,000 miles yearly over airways extending from coast to coast, from the Great Lakes to the Southwest, from the Rocky Mountain region to the Pacific Northwest and along the entire length of the Pacific Coast from San Diego to Seattle. Of that total flying mileage, more than half is done at night.

Airways improved and lighted by the Department of Commerce with equipment which calls for generous use of the non-ferrous metals, extend across the country today in an ever increasing network. Revolving beacon lights of 2,000,000 candle power are spaced at intervals of ten miles across the airways. Between the beacon lights are smaller blinker lights, all of which give to the night flying pilot a skyway as definitely marked as the steel rails over which the railroads roll. And in each beacon and blinker light is its allotment of copper and brass connections, cables and power lines.

The pilot comes in for his night landing and the air-



All-Metal, Tri-Motor Passenger Transport

minum, and forward in the pilot's cockpit the pilot adjusts to his ears radiophones that he may hear broadcast from the ground weather reports, plane dispatching reports and maintain a continuous conversation with the ground. His voice is carried by radio waves which get their original impetus from an instrument composed of brass and copper units.

Along the entire network of airways in the United States, which today stretch over 50,052 miles, are erected at intervals of approximately 200 miles radio towers, with their antennas of copper or brass. Almost all passenger-carrying airplanes today are equipped with radio receivers and transmitters permitting the pilot to be always in communication with his dispatching offices and with other stations along the route. Pilots of planes in flight exchange weather reports and other information, always on radio equipment composed of brass and copper.

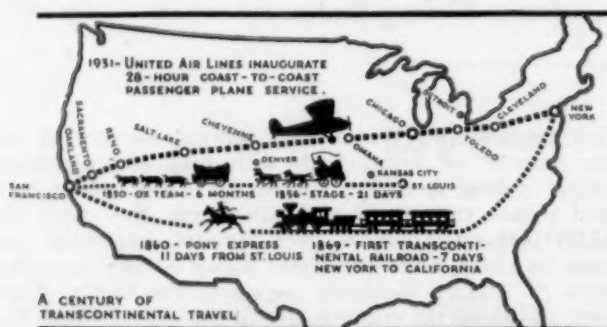
Perhaps the outstanding development in aviation in the



Luncheon Aloft

port is covered with a blanket of white light from the flood lights. The runways of the airport are outlined in lights of red and green; obstructions around the field are marked with red lights and on the plane itself are two powerful landing lights. Each individual light calls for its brass and copper connections of cables; each light performs its duty efficiently because of some non-ferrous composition.

Perhaps the outstanding contribution of radio and its non-ferrous units has been in the radio directive beacon which is an additional aid installed along the airways by the Department of Commerce. The radio beacon sends forth a continuous stream of directive radio signals which are received by the pilot in his earphones. Should he hear in his phones a "dot-dash" signal he is warned that he is flying to the left of his course. Should the signal be



From Covered Wagon to Air Line

"dash-dot" he knows he is to the right. But when the two signals blend together in a stream of "dash-dash-dash" signals the pilot knows he is following the true course laid out for him. These radio beacons are placed at intervals of approximately 200 miles along the improved airways and are operated day and night.

With the development of the aircraft engine, particularly the radial engine of the Hornet and Wasp type used by planes of United Air Lines, the problem of weight versus horsepower presented itself for solution. It was not difficult to develop a motor with sufficient horsepower to pull the giant planes through the air at tremendous speeds, but it was difficult to prepare a motor with the required horsepower and at the same time be sufficiently light in weight to be efficient.

Aluminum and other non-ferrous metals played a large part in the solution of this problem so that today, most of the material in crank cases cylinder heads, pistons, pumps and valves are aluminum or aluminum alloys. Aluminum

was found to be the most satisfactory metal to withstand the friction of a motor revolving at 1,750 r.p.m. and operating continuously at 75 per cent of its maximum power. Aluminum added to the strength and reduced the weight to such an extent that today there are on the records of United Air Lines maintenance bases Wasp and Hornet motors which have flown continuously for a full year with only the routine repair and overhaul and without a mechanical failure.

Lubricating oil, as well as fuel, is carried to the Wasps and Hornets through copper tubing. The engines are secured to their metal framework by aluminum fittings, brackets, braces. Aluminum and its alloys are found in radio brackets, shielding, masts, instrument panels, streamlines, floorings, ornamental panels and hardware in the passenger cabins.

Interesting experiments in the use of aluminum rivets and parts have been made in the United Air Lines repair base at Chicago, where one of the most extensive aeronautic repair bases in the country is maintained to keep in first-class shape the 120 airplanes operated by the company.

It was found that aluminum rivets, after heat treatment, tend to become too hard for use within two hours after treatment. It was found, however, that if the rivets were kept in cool temperatures the hardening process could be delayed indefinitely. Dry ice was used therefore to prevent the hardening with very satisfactory results.*

In the delicate instruments which are a part of the navigating equipment of transport planes today are to be found many of the non-ferrous metals because of resistance to changes in temperatures and their non-magnetic properties. Minute bellows, for example, are the delicate working parts of the altimeter which tells the pilot his altitude above sea level. The bellows principle is also used in the airspeed indicator and others on the instrument board. In the "artificial horizon," a comparatively new instrument which tells the pilot when he is on an even keel, the working part is a brass wheel which rotates at high speed and provides a gyroscopic action. The brass "gyro" is non-magnetic and is little if any affected by changes in temperature or altitude.

The present air mail and passenger network of the United States, which has been developed from a standing start twenty years ago, would be utterly impossible without the aid of the non-ferrous metals. Operations such as United Air Lines, with its 31-hour service between the Statue of Liberty and the Golden Gate, or overnight mail service between Chicago and New York, would still be aeronautical dreams, if brass, copper and aluminum had not been available.

* See The Metal Industry, September, 1931, page 383.

Finishing Refrigerator Trays

Q.—We recently received a very important order to plate ice cube trays and grids for a large manufacturer of electric refrigerators. The trays are made from No. 250 aluminum and the grids from No. 25H aluminum, both materials being pure aluminum, the only difference being in temper. The pans are of soft temper while the grids are of hard temper.

The company which manufactures these refrigerators wants these trays and grids absolutely non-corrosive, with

a soft lustre finish, as appearance means a great deal.

We would appreciate any information that you might be able to give us as to solutions, method, or any other advice that you could find in your files that would be of interest to us.

A.—The anodic treatment of aluminum to prevent corrosion is a licensed process. This process is controlled by the Metals Protection Corporation, Indianapolis, Ind., and we would advise you to get in touch with them.

OLIVER J. SIZELOVE.

Problems in Electroplating and Finishing

Answered by OLIVER J. SIZELOVE

Tin Plate on White Metal

Q.—We are making buckles of white metal which are afterward drilled out for setting rhinestones, and our customers demand that we tin plate these buckles. We do know that some people do tin plating on this soft white metal and it makes a very fine finish, looks almost like a bright nickel or silver finish, and the best part of it is that it does not tarnish. We are enclosing a few buckles of white metal to show you the type of work we would like to tin plate, and would appreciate any information you can give us as to the best and cheapest way to do this. We have soap and ball burnishing barrels here, and we can get a very bright finish on this white metal before plating.

A.—Sample buckles you have submitted can be tin plated in the following solution:

Sodium stannate	16 oz.
Sodium acetate	2 oz.
Caustic soda	4 oz.
Water	1 gal.
Temperature of solution, 160° to 180° F.	

Use one-half tin anodes, one-half cold rolled steel anodes. Operate $2\frac{1}{2}$ to 3 volts; 10 to 15 amperes per square foot.

The work should be ball burnished bright the same as samples, and wired or racked. Clean in a mild cleaner; rinse in clean cold water; pass through a cyanide dip; rinse in clean cold water; and then tin plate.

A deposit of 3 to 5 minutes should be satisfactory, and the work should then be ball burnished for a few minutes to produce a bright finish.

Rebluing Firearms

Q.—Please give us a process for rebluing firearms.

A.—In rebluing firearms the old finish should be removed by pickling in muriatic acid, and the surface should be repolished to a smooth bright color. The work should be thoroughly cleaned, and the following bluing solution used:

Water	8 oz.
Ferric chloride	2 oz.
Mercury chloride	2 oz.
Muriatic acid	2 oz.
Denatured alcohol	8 oz.

Dissolve the ferric chloride and the mercury chloride in the water, then add the muriatic acid and the alcohol.

Apply the liquid with a sponge or soft brush, but do not have an excess of the liquid on the work. Apply the solution uniformly. Place the work in a moist atmosphere (a steam bath is good to provide moisture) for an hour or so, when a red rust will form on the work. Then immerse the work in clean boiling water for 15 minutes and dry direct from the boiling water.

Then dry scratchbrush lightly with a soft crimped steel wire wheel operated at a slow speed. If the color is not dark enough repeat the operations. Finally, oil with a soft cloth moistened with paraffine or boiled linseed oil.

Oxidized Finishes

Q.—We wish to carry out some experiments in oxidized finishes on small German silver and gilding (high copper content) metal parts. We are desirous that these finishes be as durable as possible, since the small parts are subjected to wear.

We are particularly interested in a gun metal or blue finish. However, we also wish to try out some colored finishes if possible. Any information you are able to give us as to methods and formulæ for securing the above finishes will be highly appreciated.

A.—It is quite difficult to produce any of the oxidized finishes upon nickel silver. It will be necessary to copper or silver plate, and then to produce the finish.

Both copper and silver are oxidized very readily with sodium, potassium, ammonium, or calcium sulphide. We would suggest that you experiment with these chemicals dissolved in water and used with varying amounts of either sulphide to produce different colors, which will range from a blue black to jet black.

It is possible to steel ball burnish both before and after coloring on small work to produce in quantity.

All oxidized finishes should be lacquered to protect the finish.

Guaranteed Silver Plate

Q.—We have an inquiry for silver plating tea spoons, dessert spoons, etc., with a 25-year guarantee and also a 10-year guarantee.

Would you kindly give us the standard deposit of silver for this class of goods?

A.—Silver deposits on high grade work such as yours are from .0008 to .001 inch thick, and would require from 6 to 8 ounces of silver to the gross of spoons.

The deposit on the wearing part of the bowl is usually twice as thick as on the rest of the surface, and is applied in a secondary plating operation.

While a deposit of silver of the above thickness is considered a good one, we would hesitate to guarantee it to last either 1 year or 10 years. It will depend upon the amount of usage it receives and how it is used.

Rejects in Silver Plating

Q.—In the plating department of our silverware factory we have quite a number of rejects, sometimes running as high as 25%. We are wondering if you have any data from other factories showing what their percentages of rejects are. Any information you can give us will be greatly appreciated.

A.—We have no accurate data on the rejects of any particular factory in the silver plating industry, but we are sure if your rejects are as high as 25% there must be something decidedly wrong somewhere in the plating operations.

The writer is somewhat familiar with your class of work and would consider one per cent of rejects quite high in the plating operations.

The Definition and Determination of "Free Cyanide" in Electroplating Solutions

By DR. W. BLUM

Bureau of Standards, Washington, D. C.

A Definition Based on the Ability to Dissolve Metal Compounds Is Proposed¹

A PAPER PRESENTED AT THE SIXTIETH GENERAL MEETING OF THE ELECTRO-CHEMICAL SOCIETY HELD AT SALT LAKE CITY, UTAH, SEPTEMBER 2, 3, 4 and 5, 1931.

THE American Standards Association is now engaged in the preparation of electrical definitions, including electrochemical terms. The latter subject is being considered by sub-committee No. 10, of which G. W. Vinal is chairman. As a member of that sub-committee, the author has suggested a definition of free cyanide which is somewhat different from that commonly employed.

Present Usage

The term "free cyanide" as commonly used refers to some "excess" of alkali cyanide in the solution. Uncertainty exists, however, as to the basis upon which this excess is computed. In general it is implied that the free cyanide is the excess above that required to form some definite complex compound. For example, in a silver plating solution the silver is present as argentocyanide, $\text{KAg}(\text{CN})_2$, and any excess of alkali cyanide above that present in that compound is designated as free cyanide. In solutions of other metals, however, there is less agreement as to the composition of the complex salt, and in some cases there is evidence that two or more compounds exist. Thus copper solutions² almost certainly contain both $\text{NaCu}(\text{CN})_2$ and $\text{Na}_2\text{Cu}(\text{CN})_3$, and possibly more complex compounds. It was formerly assumed that in cadmium baths the metal was present as $\text{Na}_2\text{Cd}(\text{CN})_4$, but recently³ the compound $\text{NaCd}(\text{CN})_3$ has been postulated. So long as there is uncertainty regarding the composition of the complex salt, any definition of free cyanide based upon that composition is of doubtful value.

In practice, the free cyanide content is determined by chemical analysis, the most common method being titration with silver nitrate, with or without the addition of potassium iodide. With silver solutions it has been repeatedly shown that this titration defines very closely the content of free cyanide above $\text{KAg}(\text{CN})_2$, and that the results are not greatly influenced by the presence of iodide, except as the latter tends to overcome small effects of impurities such as carbonate and ferrocyanide.

With copper solutions,⁴ however, titration with silver nitrate without iodide yields variable results corresponding to ratios between $\text{NaCu}(\text{CN})_2$ and $\text{Na}_2\text{Cu}(\text{CN})_3$, while with enough iodide present, the titration corresponds closely to the latter formula. In a cadmium solution⁵ titration with silver nitrate in the presence of

iodide corresponds approximately to the compound $\text{Na}_2\text{Cd}(\text{CN})_4$, while if sufficient ammonia is also added, the total cyanide content of the solution is titrated. It is evident therefore that in copper and cadmium solutions, and probably in most others (except silver) the statement of the content of free cyanide in terms of a titration is definite only if all the conditions of titration are specified; otherwise the results are not reproducible and may not correspond with a definite compound. Although experimental data are lacking, it is at least doubtful whether for each of the various metal cyanide solutions, methods of analysis can be devised that will yield the free cyanide present above a specified compound, especially when impurities are present in the baths.

Proposed Definition

In general the object of analyzing a plating solution is to determine whether the composition is such as to permit satisfactory operation. For example, the titration of free cyanide in plating baths would not be used for control purposes unless the content of free cyanide had some known or assumed relation to the behavior of the baths. Here again quantitative data are meager, but it is safe to assume that the content of free cyanide may influence the conductivity, cathode efficiency, limiting current density, cathode polarization, throwing power and structure of the deposit; and also the anode polarization and efficiency and the character of the anode corrosion. Without any free cyanide it is certain that at relatively low current densities burnt deposits would form and the anodes would become coated. The ability of free cyanide to overcome the latter difficulties no doubt lies in its solvent action for metal compounds that exist in the solution or that may form at the anode or cathode, and is more important in considering the utility of an electroplating bath than is an exact knowledge of the double or complex cyanides which may exist in solution along with this so called "free cyanide." If, however, all of the alkali cyanide present in the solution were saturated with these metal compounds, it could obviously have no further solvent action. Such a state of affairs is the logical basis from which to compute free cyanide. No reference to the double or complex cyanides is necessary for such a definition as the following:

"The free cyanide in an electrodepositing solution is the excess of alkali cyanide above the minimum required to give a clear solution."

In this definition an effort is made to specify that property which affects directly the behavior of the bath. Whether in a given solution this definition will agree closely with one based upon stoichiometrical considera-

¹ Published by permission of the Director of the National Bureau of Standards.

² S. Glasstone, *Jour. Chem. Soc.*, p. 702 (1929).

³ L. R. Westbrook, *Trans. Am. Electrochem. Soc.*, **55**, 333 (1929).

⁴ M. R. Thompson, *Monthly Rev. Am. Electroplaters' Soc.*, **18**, 31 (1931).

⁵ W. P. Barrows, *Mimeographed Proceedings, Convention Am. Electroplaters' Soc.*, p. 161 (1930).

tions (as it does with silver), or with the result of any specified method of analysis, must be determined by experiment.

Both conceptions of free cyanide are implied in the following revised definition (6358) for the British Standard Glossary of Terms Used in Electrical Engineering: "An excess of cyanide (other than that in the soluble double cyanide of the metal) serving to prevent the formation of an insulating film of insoluble single cyanide at the anode." The two parts of this definition are not necessarily consistent. If in the first part a definite complex compound is referred to, the initial ability to dissolve metal compounds and to keep the anodes clean may not coincide with the presence of that compound.

The possible variations that may arise from the use of different definitions may be illustrated with copper solutions, in which both $\text{NaCu}(\text{CN})_2$ and $\text{Na}_2\text{Cu}(\text{CN})_3$ (or the corresponding ions) may be present. Practically it has been found that pure CuCN will dissolve in somewhat less than 1.5 equivalents of NaCN . Suppose for illustration that a bath containing 1 equiv./l of CuCN and 1.5 equiv./l of NaCN represents one that is just saturated with CuCN . Then according to the proposed definition the free cyanide content would be zero. If the free cyanide were computed on the basis of $\text{NaCu}(\text{CN})_2$, it would be $+0.5 N$; but on the basis of $\text{Na}_2\text{Cu}(\text{CN})_3$ it would be $-0.5 N$. The latter anomalous result would also be obtained by titration with silver nitrate in the presence of iodide, that is, an endpoint would be produced at once, and 0.5 equivalent of cyanide would have to be added to give a condition corresponding to the normal endpoint. If titrated without iodide, however, the endpoint might agree with 1.25 equivalents of NaCN to 1 of CuCN and the free cyanide would then appear to be $+0.25 N$. The proposed definition excludes the possibility of a negative value for free cyanide.

Principle of Analytical Methods

One very serious objection to the proposed definition is that for most solutions analytical methods are not now available for the corresponding determination. In principle such methods should determine the excess of cyanide by some reaction which does not introduce any new compounds or ions. With silver solutions this requirement is practically met by titration with silver nitrate, as the silver simply forms more of the complex salt, $\text{KAg}(\text{CN})_2$, and the resulting potassium nitrate has been shown to be without effect. But when silver nitrate is added to a copper or cadmium bath, the free cyanide forms the silver complex and it is not safe to assume that the appearance of the silver cyanide (or silver iodide) will occur at the same point that a precipitate of some copper or cadmium compound would have appeared if the free cyanide were removed by some other method. Titration of a copper bath with a cuprous salt solution would be logical, but there are no soluble, stable cuprous compounds except the double cyanide, which is automatically excluded for this purpose. Titration of copper solutions with a cupric salt, such as the nitrate, has been used, but this introduces new reactions which consume cyanide in ways other than the formation of the complex compound already present. Recently it has been found by R. M. Wick of this Bureau that titration of free cyanide in silver solutions with iodine agrees with the silver nitrate titration. Possibly this titration might be applicable to copper solutions, in which the appearance of cuprous iodide would mark the endpoint. Such a titration would introduce no new metal ions, and might not disturb the existing complex compounds.

With cadmium and zinc solutions, in which the respective metals have only one valence, it is probable that direct

titration with the corresponding chloride or sulphate would yield a result in approximate accordance with the proposed definition, though the endpoint would be less distinct than with silver nitrate, especially if iodide were also present in the latter titration. One advantage of a direct titration with a salt of the same metal is that, regardless of the composition of the complex formed in the solution, the result for free cyanide might be expressed in terms of the quantity of metal salt used in the titration. For example, if 10 ml of a cadmium solution required 10 ml of $0.5 N \text{ CdCl}_2$, the free cyanide could be expressed as "equivalent to $0.5 N \text{ CdCl}_2$," regardless of whether the solution contained $\text{NaCd}(\text{CN})_3$ or $\text{Na}_2\text{Cd}(\text{CN})_4$.

One difficulty in the usual titrations of free cyanide with silver nitrate is that the results are often affected by the presence of other constituents of the baths, such as carbonate, ferrocyanide, sodium hydroxide, or ammonia. By certain expedients, especially the addition of iodide, these effects may sometimes be practically eliminated, so that the result of the titration is the same as if these constituents were absent. But it is at least probable that such constituents may influence the quantity of cyanide required to dissolve all the metal compounds in the solution. If so they would also affect the amount of free cyanide (as ordinarily defined) that would be required to yield satisfactory operation. For example, it is generally recognized that when the carbonate content of a bath increases, more free cyanide must be used to afford good anode corrosion. To the extent therefore that a given method of analysis eliminates the effects of such constituents, it may fail to give information relating directly to the operation of the bath. If, however, the proposed definition were adopted, and appropriate analytical methods were devised, the results for free cyanide would include the effects of such constituents, and might therefore more nearly represent the behavior of the baths.

In certain plating solutions the metal is present in two different compounds, for example a zinc plating solution contains both sodium zincate, Na_2ZnO_2 , and zinc cyanide, $\text{NaZn}(\text{CN})_4$. There is no method of determining free cyanide in such a solution. Titration with silver nitrate yields the total cyanide, provided sufficient NaOH is present. If the capacity of the solution to dissolve more zinc cyanide were determined, the result would indicate merely the sum of the free cyanide and free alkali, with no present method of distinguishing them, except upon arbitrary assumptions. The same condition would exist to a lesser degree in a silver solution containing free cyanide and free ammonia, whether the latter were formed in or added to the solution. In such a case it would be more appropriate to refer to the "dissolving power" of the solution than to the free cyanide content.

At best any definition of free cyanide is of value only if it represents a quantity that (a) can be readily measured and (b) can be used to predict and control the operation of a bath. If these two requirements cannot be fully met, the ultimate choice must be a compromise. In effect the present usage involves for some baths the ready and accurate determination of a quantity that is not directly related to their operation, though with research and experience it might be correlated with it. The proposed usage involves a less convenient and possibly inaccurate determination of a quantity which directly affects the operation of the baths. Pending much needed research, either definition may be consciously or unconsciously used. In view of the above mentioned uncertainties, it seems highly desirable that in all subsequently published references to free cyanide, this term should be clearly defined and the method used for its determination should be fully described.

Plating and Polishing Equipment and Supplies

By LOUIS M. HAGUE

Assistant Sales Manager, Hanson-Van Winkle-Munning Company, Matawan, N. J.

The Basic Principles of This Industry. It Requires Trained Men With Practical Experience in the Field Which It Serves

ADVICE AND INFORMATION GIVEN BY REQUEST TO THE VOCATIONAL GUIDANCE DEPARTMENT OF LAFAYETTE COLLEGE, EASTON, PA.

IN the earlier days of industry in the United States it was sufficient for a product to perform satisfactorily the utilitarian purpose for which it was developed. Gradually the general public became conscious of finish and manufacturers cast about for means of protecting metal articles of their manufacture from abrasive and atmospheric corrosion. Such tendencies naturally bent towards enhancing the sales value of the product by improving appearance. Chief among these methods was the polishing and plating of metals.

With the rapid growth of interest in the finishing and electrodeposition of metals a business grew up manufacturing materials for use in such processing. Substantial commercial ventures of this nature began about 1865, leading to the present day organizations.

A Bird's-Eye View of the Industry

The basic engineering sciences upon which this industry is grounded are the electrical, electrochemical, chemical and mechanical fields. The important equipment products of the business are low voltage generators, full-automatic, semi-automatic, and manual plating and polishing equipment.

Supply lines may be divided into buffs, compositions and abrasives, anodes, metal cleaners, polishing wheels, chemicals and miscellaneous items.

There is a substantial difference between the equipment and supply lines both as to manufacturing methods and merchandising and sales practice.

Equipment may be regarded as being highly specialized. It is almost always built to order, with the view of performing a specific purpose, and so planned that it will deliver a definite volume of production over a fixed period. Skilled labor is required for the manufacture of this equipment. Highly technical and specialized salesmen and service engineers are employed in the sale and service of such products.

Supply lines are manufactured on a production basis and volume plays an important part in determining price factors. Semi-skilled labor is required for producing these commodities. A rounded knowledge of the industries using such supplies is essential for anyone engaging in sales work of this nature. The salesman should also have at least a semi-technical education.

Qualifications for Men Engaged in the Industry

This industry, in common with all others, requires officials, plant, production, and sales executives, and purchasing agents thoroughly competent in their respective fields. With the possible exception of strictly electrochemical work the best prospects for success for the

average individual may be found in sales, sales engineering, and service work.

In our opinion a thorough electrochemical education is not only desirable but may be regarded as essential for anyone planning on entering this field. A sound knowledge of economics is also highly desirable. Such courses, plus a rounded selection of other subjects offered in the present college curriculum, completes the educational requirements. From an academic viewpoint such an education should school the mind of the individual to a greater appreciation of facts and make it possible more readily to grasp new ideas and situations as they arise. In the light of a more practical viewpoint, basic facts of electrochemistry and economics can be stored away for future use more easily during the college years than at any other period of life. Information such as this can only be acquired under difficulties at some later period, to say nothing of the time and advancement lost by the earlier omissions.

It is impossible to generalize on the type of individual qualified for this work other than to point out the prime requirements for success in any line—honesty, interest, and the will to succeed. As a secondary consideration conversational strategy and finesse in handling people are essentials.

The plating machinery and supply industry is essentially a limited field when compared to the tremendous basic industries dealing in steel and food products. Nevertheless the salesman or engineer engaged in this work has the opportunity of calling on a widely diversified line of industries—automobile plants, automotive accessory companies, the aviation industry, aluminum plants, hardware, tool, and metal working trades, steel mills, and the general electroplating trades. While great progress in the art of finishing and plating metals has been made since 1919, the field is still unscratched, and great opportunities for original development work remain.

In closing it is well to bear in mind that irrespective of the capacity in which an individual enters this field, a period of training and education is necessary before actively engaging in sales or sales engineering work, entailing contacts with the trade. It is during this period that the benefits of a proper preliminary education are most apparent. This post-academic experience and education prepares the individual for the work in which he will establish his future possibilities of advancement and success. The trade he will serve today has properly come to expect a representative who is not only qualified to present his product intelligently, but also one who is prepared to offer practical suggestions and service in the use of the product, which will react to the direct benefit of the purchaser.

THE METAL INDUSTRY

With Which Are Incorporated
The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Contents

United Chromium Wins Patent Suit.....	465	Electroplating and Polishing Equipment and Supplies	486
The Decision Handed Down by Judge Thomas of the United States District Court in the Case of United Chromium vs. International Silver Company.		Basic Principles of this Industry. It Requires Trained Men with Practical Experience in the Field Which It Serves.	
The Oxy-Acetylene Welding of Copper and Aluminum and Some of Their Alloys	469	By LOUIS M. HAGUE	
A Description of the Applications for Welding and Methods of Welding Various Alloys, Cast and Fabricated.		Editorials	488
By FRANCIS A. WESTBROOK		Metals, Engineering and Human Progress.	
Black Background on Nickel.....	470	Copper Protected or Free.	
By OLIVER J. SIZELOVE		Impurities in Metals.	
British Institute of Metals Meeting.....	471	The Plating Supply Industry.	
Synopsis of Papers Presented at 24th Annual Autumn Meeting, Zurich, Switzerland, Sept. 13-15, and Brief Summary of the Meeting.		Railroad Freight Rates.	
Research in Bronzes.....	473	Thomas Alva Edison.	
Review of Published Results of Research Performed at Metallurgical Plants at Billancourt, France.		Save the 1930 Platers' Guidebook.	
Smelting Secondary Aluminum and Aluminum Alloys	474	Correspondence and Discussion. New Books, etc.	490
Part II of a Series on Reclamation of all Forms of Scrap and Used Aluminum.		Shop Problems	491
By DR. ROBERT J. ANDERSON		Patents	493
Metal Cleaning	476	Equipment	495
By OLIVER J. SIZELOVE		Variable Multi-Speed Drive.	
Correction	476	Refractory Cement.	
Deep Etching of Brass Applied to Gating.	477	Small Ingot Molds.	
By R. W. PARSONS		New Oblique Tumbling Barrel.	
Experimental Plating Cell.....	480	High Speed Gear Unit.	
By T. F. HAWLEY		New Wire Cutter and Stripper.	
Finishing Ash Trays.....	480	"Leadheseon" Coating Process.	
By OLIVER J. SIZELOVE		Centrifugal Acid Pumps.	
Flying Would Be Impossible Without Metals	481	New Potentiometer Pyrometer.	
By G. E. EVERETT		Zinc Slinger for Hot Galvanized Work.	
Problems in Electroplating and Finishing	483	New Finish Grinding Wheels.	
Answered by OLIVER J. SIZELOVE		Surface Grinding Attachment.	
The Definition and Determination of "Free Cyanide" in Electroplating Solutions	484	Gas-Heated Soldering Iron.	
A Proposed Definition Based on the Ability to Dissolve Metal Compounds.		Synchronizing Alternators.	
By DR. W. BLUM		New Alloy for Battery Plates.	
		Cleaning and Coating Stove Parts.	
		Equipment and Supply Catalogs.	
		Associations and Societies.....	499
		Personals	500
		Obituaries	501
		News of the Industry.....	502
		Review of the Wrought Metal Business...	509
		Metal Market Review	509
		Metal Prices	510
		Supply Prices	512

THE METAL INDUSTRY is regularly indexed in the "Engineering Index" and the "Industrial Arts Index"

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Editorial

Metals, Engineering and Human Progress

There has been much discussion recently about the benefits of engineering in human progress. The wide publicity given to the question of technological unemployment, the idleness caused by labor saving and labor eliminating machinery, has caused some "thinkers" to question the ultimate value of engineering as an aid to humanity.

We are now admittedly in a machine age. History has shown that the effect of machinery has been first to displace some workers and then to create new work for others. Over a long period of time this has resulted in enormous progress but it has caused many temporary dislocations and much local suffering. At the same time the wonders of electricity, communications, transportation and automatic manufacturing equipment have brought better and cheaper food, clothing, sanitation and housing, and a wider horizon to countless millions who could not have dreamed of such luxuries 100 years ago.

But it may be said all these are merely physical—things of the body. What of the mind? For the mind we have more and cheaper books and magazines within reach by purchase or free through lending libraries, for everyone. We cannot make people read the best literature, nor can we make them read at all if they choose not to, but we have made literature available to those who want it. Actually the result is that in these days more is read than has ever been read before. The phonograph, the radio and the motion picture have brought music, lectures and drama to the rank and file. To be sure they have brought the worst as well as the best, but it lies entirely with the listener to choose the best, as it is at his hand. The worst is provided, not because of the "evils" of engineering or the evil intent of the producer but because there is a demand for it.

Science and its divisions, engineering, physics and chemistry are impersonal. The use made of them depends upon the people who are doing the using. Good uses are made by good people and vice versa.

By and large our growth toward a better social organization has been the result of education. Legal methods unassisted by the education of the masses up to the standards of such laws have generally failed. The ultimate solution of our social problems is, therefore, education. But it is just as fundamentally true that widespread education, within the reach of all classes and levels, is an absolute impossibility without the aid of science and the inventions which have sprung from scientific and technological progress.

In the long and arduous battle with darkness, in the development of inventions of world-wide significance and effect such as telegraph, the dynamo and motor, the printing press, the telephone, the phonograph, the electric lamp, the steam engine and turbine, the automobile, the airship, the radio and lastly, television, metals have played the part of a subordinate, perhaps, but indispensable aid. To see this clearly one need only ask oneself how many of the above inventions could have been developed without copper, type metal, bearing metals or aluminum. Quietly but unceasingly, alloy development and new metal products are laboring toward perfection—if there is any such thing. We have now in process such

improvements as better and more widely useful forms of metal powders. We have vacuum casting and centrifugal casting. We have now many varieties of metal foil. We are beginning to use fusible metal to help in pipe bending. Little things? Perhaps, but no smaller than the tooth in a gear wheel, the absence of which stops the machine. And in all the above we have not yet mentioned the thousands of ramifications of electroplating for protection against abrasion and corrosion, and for decoration.

The metal industries are hewers of wood and drawers of water. Only recently has the public paid much attention to its progress as it is seldom spectacular. Even the electric brass melting furnace, a most revolutionary development attracted little attention from the public.

But after all when one considers fundamentals, public attention is of minor importance. Let metals remain only a cog and they will be content knowing that they are a sturdy cog and that they must be sound, for without them the machine breaks down.

Copper Protected or Free

As we go to press a conference is being held on copper by the leading producers, the world over. The question is in its simplest terms—What to do? The present price, about 7c. a pound is below the cost of production of all but a very few mines.

Viewing this problem as world-wide, there is only one common sense answer—to reduce output at this time, to drop differences of opinion and to cooperate, each producer taking his fair proportion of the reduction.

In the United States, however, a complication has arisen in the form of the old familiar demand for a tariff. It is claimed by some important American producers that we will soon be no longer able to compete in foreign markets even though we have for decades been the most important world supplier of red metal. Consequently we can do nothing but save our American mining interests with the communities dependent upon them, by protecting American copper, to such an extent as to keep the foreign metal out completely.

It is significant that the opinions expressed have so far, varied directly with the individual interests from which they have come. The high cost mining companies want a tariff. The American interests producing metal abroad and refining in the United States want no tariff. Of course, the foreign producers want no tariff. If we place a tariff on copper will not the foreign companies refuse to co-operate in rationalizing (reducing) output? Then we must once for all be content with our American markets only. Is this to the best interests of the copper industry, producing, refining and fabricating, or had we not better co-operate with the world in what we have long stood as a world leader?

Copper has gone through many cycles of expansion and depression. In 1886-1887 came the first African development which depressed prices. In 1894 the Butte mines came in and in 1901-1904 the increase in Arizona and Michigan output had the same effect. In 1907 the Utah and Nevada porphyries threatened to swamp us, as did in 1920, the South American mines. And now the large African properties loom ahead forbiddingly. But

world consumption has always caught up and closed these gaps. The trouble with the copper industry has not been lack of outlets but sudden growth at different intervals—in other words uncontrolled fluctuations. By a large proportion of those engaged in the industry this has been debited to bad management. Perhaps we need another keen mind like the late Dwight Morrow who served the copper interests so well, to hold the warring factions together.

Impurities in Metals

The great bugbear of the metal working shops in all their branches has always been impurities—impurities in the form of metals, non-metals and gases. In many cases even minute quantities have been enough to cause trouble. An interesting and clearly written summary by H. M. St. John in a recent issue of *Metals and Alloys*, gives the skeleton framework of this problem as it affects cast brasses and bronzes.

Many of the metallic impurities are soluble and are consequently not visible as such. But they exert, nevertheless, an important influence, affecting grain size and changing the critical temperatures at which annealing is carried on. They may also affect the solubility of other metals, causing precipitation of undesirable elements. Soluble metallic impurities will form separate phases which may segregate along grain boundaries or be dispersed throughout the body of the grains themselves. Those metallic impurities which form simple solid solutions with the metal generally increase the hardness and tensile strength, but lower the ductility. Insoluble metallic impurities generally increase the hardness but very often seriously impair the ductility. Non-metallic impurities are extremely harmful, being hard and brittle, and lowering both the ductility and resistance to shock.

Gases may be absorbed by alloys in huge volumes, often equal in amount to that of the metal itself. They almost always have an embrittling effect causing fractures which follow along grain boundaries. It is known also that a large proportion of the gas in a melt is evolved during the process of solidification, which often results in serious porosity.

Vigilance against impurities must be maintained throughout the entire life of the metal. The raw material must be pure and the melting and casting process such as to exclude from it the undesirable strangers. This problem is probably the greatest single enemy of the brass foundry.

The Plating Supply Industry

Like all other industries, electroplating must have its assistants. As it has grown older, greater and stronger, with it has grown the business of supplying equipment and materials, not only in size but in importance and dignity. An article on page 486 of this issue by L. M. Hague shows clearly its present high standing.

The engineering sciences which form the basis of this industry are, as in the case of electroplating itself, electricity, chemistry and mechanics. The important equipment centers about low voltage generators, plating tanks and polishing machines. The supplies consist largely of buffs, compositions, abrasives, anodes, metal cleaners, polishing wheels and chemicals. The equipment is largely built to order, each case requiring individual specifications. The supplies can be produced in large quantities.

Salesmen to the plating trades have changed greatly in the past 20 years. It is no longer a door to door peddling business. The salesmen of equipment should be and are often technically trained. In other words they are sales engineers, able to discuss with the purchaser the

mechanical features, electrical wiring connections and the chemicals involved. Salesmen of supplies are often semi-technical and in many cases even technical men. It is of even greater importance, however, that in both these divisions the sales representatives should have had considerable practical experience in electroplating and finishing. It is being more and more generally required of them that they be able to advise customers in difficulties. They must be able to help and serve their trade as well as to sell to it.

Railroad Freight Rates

The long awaited decision of the Interstate Commerce Commission in the case of the request by the railroads for a 15 per cent increase in freight rates, has allowed what seems at the first glance to be a few limited increases, but in these the metal industries have many points of contact. Copper and zinc ores are subjected to a rise of \$3.00 per carload. On all other commodities (including those of non-ferrous metals and metal products, but excepting agricultural products) the rates are raised 2c. per 100 pounds; this includes also less than carload lots. Among the other items, many figure as supplies for mills, smelters and factories. The rate on coal is raised \$3.00 per carload; lumber \$3.00 per carload; petroleum oils, lubricating oils, cement, brick and building tile, 1c. per 100 pounds. The total direct rise in cost to non-ferrous metals has been estimated by Metal and Mineral Markets at \$2,000,000 per year. The indirect rise on supplies and equipment is perhaps even more.

We all know that the railroads need help, and that they are in a difficult position as their rates and costs (largely labor) are controlled by the Interstate Commerce Commission. Non-ferrous metals are asked to contribute at least \$2,000,000 per year and probably twice that figure in total. Can they and will they do it? Or will these increases drive the freight business still more into trucks, and wherever possible, ships?

Thomas Alva Edison

The greatest inventor in the history of America is dead—Thomas Alva Edison. His career was fascinating for its close contact with humanity. His inventions were all of the "practical" type, to a great extent used directly by the rank and file of the people. His name became a household word through his invention of the incandescent electric lamp and the phonograph, but industry knew him also through his improvements in telegraph instruments, the electric dynamo or generator for power, the alkaline storage battery and his glimpse of the vacuum tube which is now the basis of radio. At almost every step, Edison needed the use of metals. Brass and copper served him unobtrusively, perhaps, but well. The industry may well take pride in the aid which it gave to one of the world's great geniuses.

Save the 1930 Platers' Guidebook

The 1931 edition of the *Platers' Guidebook*, which was issued by THE METAL INDUSTRY this year, contains plating and finishing information which supplements the data included in the first edition of the *Guidebook*, which was issued in 1930. Both books should be kept, as none of the information in them is duplicated. Future issues may supersede those already issued, when they do, definite mention of the fact will be made in the book. Unless such notice appears those requiring the information in them should save all the *Guidebooks* issued and thus have a complete library of finishing information.

Correspondence and Discussion

Chromium Plated Plywood

To the Editor of THE METAL INDUSTRY:

As is well known, the idea of chromium plating is to produce a hard, brilliant, corrosion-resisting surface on metal. Hence there is no reason why plywood faced with steel, copper, or brass should not be chromium plated. Obviously this would not apply to plywood metal-faced on one side only. It would be necessary to immerse the plywood sheets in the plating tank. This would not be objectionable provided the plywood edges were sealed with white lead or other suitable substance, as the wood would not come in contact with the chromium plating solution. From the plater's viewpoint there would be no difficulty, the flat surfaces being excellent for the deposition of chromium, but the question is whether the advantages secured would justify the expenditure incurred.

Experience proves that a chromium plated surface properly applied is as hard as strengthened iron or steel, resists abrasion, and

will retain a bright surface under atmospheric influences and other adverse conditions. The bright lustrous surface would be excellent for decorative purposes, the polish given being equal to that of any highly treated metal.

Manchester, England.

A. EYLES.

"A Great Help"

To the Editor of THE METAL INDUSTRY:

We have your letter of Sept. 16th and also the information you obtained for us on our mechanical nickel plating solutions. We wish to take this opportunity to thank you very kindly for this service as it certainly proved a great help to us.

J. V. PILCHER MFG. CO., INC.,
George A. Knapp.

Louisville, Ky.

New Books

Useful Information About Lead. Published by Lead Industries Association, 420 Lexington Avenue, New York, cloth bound, 104 pages, illustrated. Price \$50 postpaid.

This book tells concisely the story of lead and its principal uses and should be of interest and practical value to every present or prospective user of lead and the multitudinous products derived from it. Short chapters are devoted to the major industries consuming lead and the part lead plays in them, as well as the history, mining, smelting and refining of the metal, best indicated by the following chapter titles: From Mine to Finished Metal, Grades of Virgin Lead, Physical Properties of Lead, Lead Alloys, Chemical Corrosion Resistance of Lead, Lead Compounds, Lead Paints, Metal Protective Lead Paints, Lead Storage Batteries, Lead Covered Cable, Lead in Plumbing, Ammunition, Architectural and Ornamental Qualities, Some Miscellaneous Uses, Industries Using Lead. The table of properties of lead includes mechanical, thermal, electrical, optical and other constants. The chapter on lead compounds describes the manufacture and use of the more important varieties and has appended a table of many others,

their characteristics, manufacturing and uses. Many corrosive chemicals handled in lead equipment are listed and typical formulae of important classes of alloys are given.

Metal Statistics 1931. American Metal Market, 111 John Street, New York. 552 pages, 4x6 inches; price, \$2.

This is the twenty-fourth annual edition of this valuable compilation of statistics covering all phases of the ferrous and non-ferrous metals. The figures in it supply complete statistical data as to production, consumption, imports, exports, stocks, prices, trade terms, brands, specifications, analyses, tariffs, etc.

Wire and Wire Products and Buyers Guide and Year Book of the Wire Association. Published by Wire and Wire Products, New York. (Direct from publishers).

This is the annual year book of the wire industry which contains a list of wire mills in foreign countries, the year book of the Wire Association, statistical information on the wire industry of the United States and indices of the principal articles which have appeared in Wire and Wire Products from 1926 to 1930 inclusive.

Technical Papers

The Freezing Point of Platinum. Research Paper 326, Bureau of Standards, Department of Commerce. 5 cents, from Supt. of Documents, Washington, D. C. A paper by Wm. F. Roeser, F. R. Caldwell and H. T. Wensel.

Dimensional Changes in Manufacture of Electrotypes. Research Paper 308, Bureau of Standards, Department of Commerce, by N. Bekkedahl and W. Blum, 10 cents from Supt. of Documents, Washington, D. C.

Purification and Analysis of Alkali Cyanides. Research Paper 323, Bureau of Standards, Department of Commerce, by M. R. Thompson. 5 cents, from Supt. of Documents, Washington, D. C.

Measuring Temperatures of Molten Metal in the Brass Foundry. by H. M. St. John. Trans. American Foundrymen's Association. This paper was presented before the May, 1931, meeting of the Association Technique de Fonderie de France, the French foundry technical association, as the exchange paper from the American Foundrymen's Association. The author presents a discussion of the need for controlling pouring temperature of nonferrous metals, and the applica-

tion of control. Types of pyrometers available are described together with precautions which must be taken in use and maintenance for trustworthy results.

Effect of Pasteurization upon the Vitamin C Content of Milk in the Presence of Certain Metals, by E. W. Schwartz, F. J. Murphy and Gerald J. Cox, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Government Publications

Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, application should be made to the governmental body responsible for the publication.

Bronze Castings. Federal Specifications Board, Washington, D. C. Proposed Revision of Federal Specification No. 172a for Bronze Castings. The Board will supply copies on request and wishes comment or criticism not later than 10 weeks from Oct. 27, 1931.

Zirconium. Bureau of Mines, Department of Commerce, Part II. Domestic and Foreign Deposits, by E. P. Youngman. Information Circular 6456.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN
W. J. REARDON

W. J. PETTIS
P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE
G. B. HOGABOOM

A. K. GRAHAM, Ph.D.
WALTER FRAINE

Solutions sent for analysis must be **PROPERLY PACKED**, to prevent leakage and breakage. Chromium solutions should be sealed with glass stoppers. Label all bottles with name and address of sender. Mail all samples to 99 John Street, New York.

Acid-Resistant Floors

Q.—Kindly advise us as soon as possible what material you would recommend for floor covering around acid dipping and pickling tanks. We are anxious to get an inexpensive material which will not be corroded.

A.—A mastic asphalt composition makes an ideal covering material for either plating or dipping room floors. If this material can be obtained in your city, we would recommend its use. If you are unable to obtain this material, then proceed as follows:

Place upon the wooden floor a layer of 3-ply tar paper, using a hot coat of asphalt to seal the overlap of the paper. Then place a layer of a cement and ashes mixture to a depth of 4 inches upon the tar paper. When dry, place a layer of concrete to a depth of 1 inch; and when this is thoroughly dry, apply a coating of hot asphalt.

A floor prepared this way with the proper pitch for draining purposes will last for many years. O. J. S., Problem 5,041.

Books on Foundry Metals

Q.—One of our customers desires to purchase a book on brass foundry practice which will give the comparative machining and non-corrosive values of the various mixtures made in the brass foundry. He is particularly interested in non-ferrous castings used in pumps for water. We would be pleased to have you recommend the book that you believe covers this phase of brass foundry practice.

A.—We do not know of any book that is published on brass foundry practice which gives the comparative machining and non-corrosive values of the various mixtures used in pumps for water. But the annual book issued by the American Society for Testing Materials is good; also, "Alloys," by Sexton; and "Brass Foundry Alloys," by Buchanan. These are all obtainable through our business department.

However, more information along this line can be had by keeping in touch with the various issues of THE METAL INDUSTRY, which often publishes problems of this nature sent to this journal for opinions, and also articles on various alloys from time to time.

W. J. R., Problem 5,042.

Books on Patterns

Q.—The writer wishes to obtain a copy of the best book on wood and metal patterns. Kindly let us know what you would recommend.

A.—"Practical Pattern Making," by F. W. Barrows; and "Pattern Making and Foundry Practice," by L. H. Hand. These books are available from our business department.

W. J. R., Problem 5,043.

Brush Nickel Finish

Q.—I am mailing under separate cover a sample, I would like to know how it was plated, what formula was used, and how to keep up the solution.

I have tried to reproduce it, but have had to give it up. I tried pumice powdered wet brush; nickel plate polished with fine emery, but it would not show up like sample. Do you think it is some kind of nickel plate work? I also used boric powder, 3 oz. per gallon. But I cannot get this particular finish that we must get.

A.—The finish on sample submitted is called a brush nickel finish, and is produced as follows:

The cold rolled stampings are brushed on a tampico wheel, using oil and emery mixed. Wash in gasoline or carbon tetrachloride and clean in an alkaline cleaning solution. Then plate in a good operating nickel solution for 20 minutes. Brush by using a small crimped steel wire wheel and FF pumice stone, mixed with water. The wire brush wheel should be about 4 inches in diameter and is operated at 800 r.p.m. After the work is brushed it is cleansed of all pumice, and then lacquered. Use the following formula for the nickel solution:

Double nickel salts	8 oz.
Single nickel salts	4 oz.
Boric acid	2 oz.
Sodium chloride	2 oz.
Water	1 gal.

O. J. S., Problem 5,044.

Colors on Steel

Q.—We have a problem in finishing small stampings made of .0240 steel. Due to the form in which they are turned out, tumbling is impracticable as it badly deforms them. We would like to give these stampings a finish of some kind which would cover the "steely" appearance. As the quantities will run in the thousands, we would like to get by with one handling if possible, and are not particular about the color; either dead black, red, green or any brilliant color would do very nicely, and if other than black it would not have to be flat, that is, there would be no objection to some lustre.

We wish you would tell us whether there is not some dipping process which we can employ which will do the work in one operation; that is, without several handlings; finish to be sufficiently durable to withstand a certain amount of rubbing of the finished parts against one another in shipping and handling. Have thought of lacquer, but it does not seem to leave a hard enough finish. Then, too, the rivets which will attach the stamping to cardboard would also have to be lacquered and there is strong likelihood that in riveting, the lacquer on the rivets would be scratched off. Can you help us out of this problem?

A.—It is quite a difficult job to produce a variety of different

colors on steel work, unless they can be plated in various solutions to produce the color upon the plated finish.

The best method to produce a blue or blue black color on such work as yours in bulk is to use the sodium nitrate method. This method consists of cleaning thoroughly, then drying and immersing the work in a bath of molten sodium nitrate. The sodium nitrate is placed in an iron pot and heated to the melting point, which is about 700° F. The work is left in the nitrate bath for 5 to 10 seconds; the excess of sodium nitrate is removed by shaking the work before it becomes cold; and then the work is washed in a hot water bath to completely remove any traces of the sodium nitrate.

If the work is oiled, using sawdust moistened with paraffin oil, it will prevent rusting and also help to produce a darker color.

O. J. S., Problem 5,045.

Burrs on Screw Machine Parts

Q.—We are sending you a few small brass ears which we are making on an automatic screw machine. We are having trouble with tumbling these parts and removing the small burr left between the teeth from the cutting-off tool.

Kindly advise us if you know of any method of tumbling and eliminating these burrs.

A.—We do not believe there is any tumbling method that will completely remove the burrs on the samples submitted. We suggest that you try tumbling in a brass oblique barrel, using 1 oz. cream of tartar to each gallon of water. Place just enough water in the barrel to cover the work and operate barrel at 50 to 60 r.p.m.

We believe the problem is one for your screw machine department, and not the tumbling department, for with the proper grade of brass and the proper cutting-off machine the burr should be eliminated.

O. J. S., Problem 5,046.

Centrifugal Casting

Q.—We are very much interested in the "centrifugal" method of casting pump liners, etc., and if you have any information in this connection we would appreciate it.

A.—Centrifugal casting has become commercial and numerous patents have been issued on centrifugal casting in the U. S. and Europe, all of which are practically the same method used in Russia 80 years ago.

The Sandusky Foundry and Machine Company, Sandusky, Ohio, casts bronze paper mill rolls and propeller sleeves very satisfactorily by this method, and we can not see any reason why you can not cast pump liners successfully.

The design of the machine is important for your work; therefore we would refer you to THE METAL INDUSTRY articles by Robert F. Wood, in May, July and December, 1925. These articles will put you in position to better understand centrifugal casting, and to my mind cover what you desire.

W. J. R., Problem 5,047.

Cleaning Old Cast Brass

Q.—We would like to find out how small brass castings can be cleaned. We would like to reclaim brass parts that have been used and have an accumulation of oil, tallow, and similar greases on them. We want to get them as near the original casting color as possible.

A.—In cleaning the brass castings the oil or grease should be removed by using gasoline, carbon tetrachloride, or an alkaline cleaning solution at boiling temperature. Such cleaners may be purchased from advertisers in this journal.

After this cleaning operation, use a bright dip made from sulfuric acid 2 parts, nitric acid 1 part. To each gallon of this mixture of acids, add 1 pint water and 1/4 oz. muriatic acid. In preparing this dip heat will be generated, and the dip should be left to cool before using.

After dipping, rinse in clean cold water, pass through a cyanide dip made of sodium cyanide 6 ozs., water 1 gallon; then rinse again in clean cold water and then in hot water and dry in hardwood sawdust.

O. J. S., Problem 5,048.

Lacquering Brass

We need information on a method of polishing brass pipe. If possible, we would like to obtain a lacquer that can be applied directly after polishing with iron oxide rouge. If this is not practical, and it is necessary to clean or wash the piece before lacquering, we would appreciate any recommendations you have to offer. May we ask you, however, to recommend a clear lacquer which experience has shown to give satisfactory results.

A.—The lacquer makers advertising in this journal can supply you with the correct material.

When using any lacquer regardless of quality, the work should be wiped with a clean cloth to remove any dirt that will show through the lacquer after drying.

A firm we know well is using lacquer on suit case brass locks. The work is lacquered as it comes from the polishing department, without any washing operation (a soft cloth being used to remove any finger marks). They have never had any complaints.

O. J. S., Problem 5,049.

Refining Solder

Q.—In your July issue, under shop problem No. 5012, you state that zinc is easily removed from solder. We operate a solder bath of approximately 4,000 lbs. Most of the work soldered in this bath is pure copper. Occasionally it is necessary to solder brass. We know the maximum amount of copper that can be present, but do not know how much zinc can be present before experiencing trouble in soldering. Analysis shows the percentage of zinc in this bath to be less than .01%. We would appreciate having you send us the method of removing zinc from solder; or tell us where we may find reference to it in the literature.

A.—To remove zinc from solder pot, boil up the solder by inserting a raw potato or a block of green wood to the bottom of the kettle and boil the metal thoroughly. Then add sal ammoniac. Let stand for a few minutes and skim. Boil the metal again and cover with litharge (oxide of lead) and let it stand for 30 to 50 minutes. Then lower the fire under the kettle so that the metal is just melted. Then skim and the zinc will be removed. That is, if the metal contains less than 1%.

Removal of over 1% requires an increase in the temperature of the metal. Burn out as much of the zinc as possible. Then boil the metal and use the same process as for less than 1%. The zinc is given off readily and goes into the slag. Flux with rosin and sal ammoniac.

We know of no literature on this subject.

W. J. R., Problem 5,050.

Tinning Bearing Castings

Q.—What have you to suggest as to the best method of tinning cast iron babbitt or bearing boxes to make the babbitt adhere most firmly to the backing? We have a way, but it is too slow and none too satisfactory.

A.—The article must be freed of sand and scale, which is accomplished by using a solution of hydrofluoric acid and water; 10 to 20 acid to 80 to 90 water. The acid should be placed in a wooden tank. After the pickling process, the articles are washed in clean water, then rinsed with water containing two or three ounces of sodium carbonate to each gallon of water, which neutralizes the acid and prevents rusting or oxidizing. The articles are now heated by gas or coal fire. It is necessary to heat up to 450 to 500 degrees Fahrenheit, so that when the tin is applied it will not congeal too rapidly by chilling.

The next operation is to apply the flux, which consists of saturated solution of zinc, by swabbing the part to be tinned when a temperature of 200 degrees is reached on the casting. The tin bath should be maintained at 500 degrees. The surface of the molten tin should be sprinkled with a little sal ammoniac to remove the dross.

The article is now ready for tinning, which can be done by dipping the casting in the tin or pouring metal on the casting and letting it drain back into the pot. Wipe the casting with plumber's tow, so the hand will not burn.

W. J. R., Problem 5,051.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,815,528. July 21, 1931. **Lead Alloy.** Robert Jay Shoemaker, Chicago, Ill., assignor to S. & T. Metal Company, Chicago, Ill.

A slightly hardened, tough, non-corrosible lead alloy consisting essentially of lead and the following substances in amounts by weight substantially as follows: calcium 0.05% to 0.4% and cadmium 0.5% to 2.0%.

1,815,638. July 21, 1931. **Process of Plating Metal.** William E. Watkins, New York, N. Y., assignor to Copper Plate Sheet & Tube Company, New York, N. Y.

The method of forming a plating of an alloy of two or more metals on a metal base which comprises forming a liquid plating mixture containing the metals of the alloy in finely divided form, applying the plating mixture to the metal base, subjecting the coated metal to a temperature that will cause one of the plating metals to diffuse into the other to form the desired alloy, said temperature being less than the melting temperature of either of said metals, maintaining the temperature of the sheet below the melting temperature of the coating metals until an alloy of the coating metals is formed and then subjecting the coated metal to a temperature sufficient to form a nonstripping plating of the alloy on the metal base.

1,816,152. July 28, 1931. **Composition for Cadmium Plating Baths.** Chad H. Humphries, Indianapolis, Ind., assignor to James C. Patten, Indianapolis, Ind.

A composition of matter adapted for use in forming an acid solution for the electrodeposition of cadmium, consisting of a dry mixture, comprising a salt having a sulphuric acid radical, a cadmium salt soluble in water in the presence of such radical salt to form cadmium sulphate, ammonium sulphate and a brightening agent.

1,816,509. July 28, 1931. **Method of Treatment of Nonferrous Alloys.** Edmund Merriman Wise, Cincinnati, Ohio, assignor, by mesne assignments, to The International Nickel Company, Inc., New York, N. Y.

The process of treating a Cu-Ni-Sn alloy comprising approximately 2½% to 20% Sn; 3½% to 50% Ni; the remainder Cu—based on an aggregate of 100% of the three metals mentioned—which comprises subjecting said alloy to homogenizing treatment at a temperature below the melting point of the alloy and not substantially below 600° C., and then quickly cooling said alloy.

1,816,617. July 28, 1931. **Method of Galvanizing.** Julian L. Schuele, Kokomo, Ind.

The method of applying an adherent zinc coating to a metallic base which consists in first subjecting such metallic base to an electrolytic zinc coating bath; second, subjecting the same to an acid etching bath and finally subjecting the same to a molten zinc bath.

1,816,837. August 4, 1931. **Process of Finishing Cadmium Plated Goods.** Carl A. Ganser, Hartford, Conn.

The method of giving a lustrous surface finish to cadmium plated goods which consists in the withdrawal of said plated goods from the electrolytic bath and, before any perceptible change takes place in the surface of the cadmium plate from its condition while in the electrolytic bath, subjecting said surface to the action of an extremely dilute aqueous solution of an oxidizing acid.

1,816,961. August 4, 1931. **Alloy and Method of Preparing Same.** Hugh S. Cooper, Cleveland, Ohio, assignor to Beryllium Corporation of America, New York, N. Y.

An alloy containing silver and from 3% to 5% of beryllium.

1,816,983. August 4, 1931. **Process of Forming Magnesium Alloys.** Gilbert Michel, Bagneux, France, assignor to Societe "Le Magnesium Industriel," Paris, France.

The process of forging alloys composed in greater part of magnesium, and containing less than 6% copper which comprises subjecting the member to be forged to a temperature of about 485° C. and maintaining the said member at the said temperature.

1,817,245. August 4, 1931. **Coating for Metal Casting Molds and Cores.** Meyer L. Freed, New York, N. Y., assignor to Henry A. Goldwynne, New York, N. Y.

A coating for cores and molds used in casting metals consisting of anhydrous aluminum silicate and a binder.

1,817,311. August 4, 1931. **Method and Means for the Obtaining of Decorative Effects upon Textile Fabrics by Brilliant Metallic Deposits.** Marie Claude Roger Hedde, Paris, France, assignor to the firm: La Societe Dite: Societe Nouvelle de Metallisation, Paris, France.

Method of obtaining decorative effects on textile fabrics by the application of brilliant metallic deposits, comprising melting the metal or alloy to be deposited, spraying said molten metal or alloy in finely divided droplets upon determined parts of the fabric's surface to be decorated.

1,817,561. August 4, 1931. **Lacquer.** Irvin W. Humphrey, Dover, N. J., assignor to Hercules Powder Company, Wilmington, Del.

A lacquer including nitrocellulose, dipentene and a colloidal agent.

1,817,582. August 4, 1931. **Cleaning Composition.** Sherman W. Putnam and Noland Poffenberger, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich.

A composition of matter consisting of a mixture of carbon tetrachloride and propylene dichloride.

1,817,888. August 4, 1931. **Protective Coating (Alborizing).** Russell Edmund Lowe, New York, N. Y., assignor to Doherty Research Company, New York, N. Y.

The method of forming a protective coating on a ferrous article, comprising covering the surface of said article to be coated with a uniform deposit containing between .05 oz. and 1.25 oz. of divided aluminum per square foot of said surface, said deposit containing also anhydrous borax, and alloying said aluminum with said surface by heating under conditions deterrent to the oxidation of said aluminum.

1,818,179. August 11, 1931. **Electroplating.** Leon R. Westbrook, Cleveland Heights, Ohio, assignor, by mesne assignments, to The Grasselli Chemical Company, Cleveland, Ohio, a Corporation of Delaware.

An electroplating bath comprising an aqueous solution containing a cadmium compound, a cyanide, a brightening agent, and an acidic naphthalene compound capable of coupling with a diazo compound.

1,818,196. August 11, 1931. **Method of Coating Substances.** Hugh S. Cooper and Menahem Merlub-Sobel, Cleveland, Ohio, assignors to Kemet Laboratories, Inc., a Corporation of New York.

Process of coating substances with at least one of the metals from the group consisting of the alkali metals and the alkaline earth metals, which comprises treating the metal with substantially anhydrous liquid ammonia, applying the resulting metal solution to the substance to be coated, and driving off the ammonia to leave a coating containing the metal.

1,818,229. August 11, 1931. **Electroplating.** George Lutz, Rocky River, and Leon R. Westbrook, Cleveland Heights, Ohio, assignors, by mesne assignments, to The Grasselli Chemical Company, Cleveland, Ohio.

An alkyl-naphthalene sulfonic acid as an addition agent to an electroplating bath.

1,818,379. August 11, 1931. **Process for the Manufacture of Metallic Sheets.** John R. Cain, Washington, D. C., and

Gibson Yungblut, Dayton, Ky., assignors to The Richardson Company, Lockland, Ohio.

That process of forming an electrodeposited metallic object, which consists in plating the object onto a cathode, elongating the cathode to at least twice its original length, severing the cathode to form an article of the desired shape, and plating the cathode metal from said object back onto the remainder of the original cathode, thus forming a new cathode having original thickness of the cathode metal and half of the plated thickness of the same metal as the metallic object, and then plating on the new cathode with the metal of the object to form a new blank for elongating, for the purpose described.

1,818,547. August 11, 1931. **Lacquer for Application by Brushing.** Hans Finkelstein, Uerdingen, Niederrhein, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfurt-on-the-Main, Germany.

A lacquer for application by brushing, comprising from 8 to 25 parts of collodion cotton which forms solutions of low viscosity and of which at least 15 per cent are soluble in 96 per cent ethyl alcohol, an artificial cyclic ketone resin, a mixture of from 80 to 20 parts of ethylene glycol monomethyl ether with from 20 to 80 parts of a solvent which corresponds to the general formula $\text{HO}-\text{C}_n\text{H}_{2n}-\text{OR}$ (in which R indicates an alkyl group with from 1 to 4 carbon atoms) and n is 2, 3 or 4 and which contains at least 5 carbon atoms in its molecule and from 67 to 10 parts of a solvent, containing a substantial portion of ethyl alcohol.

1,818,774. August 11, 1931. **Zinc Alloy.** Leland E. Wemple, Chicago, and Floyd A. Warren, Peru, Ill.

As a composition of matter an alloy characterized by the fact that it is of substantially greater hardness than zinc and capable of being mechanically worked, composed of zinc 100 parts, copper 0.1 to 2.25 parts and antimony 0.01 to 2 parts.

1,818,909. August 11, 1931. **Process for Precipitating Rhodium, Iridium, Osmium, Ruthenium and the Like.** Engbert Harmen Reerink, Eindhoven, Netherlands, assignor to N. V. Phillips Gloeilampenfabriken, Eindhoven, Netherlands, a Limited Liability Company of The Netherlands.

A process for precipitating on a body at least one of the metals rhodium, iridium, osmium and ruthenium, comprising heating said body in an atmosphere containing at least one volatile carbonyl halogen compound of the metal to be precipitated.

1,819,130. August 18, 1931. **Electroplating and Electroplating Apparatus.** Joseph A. Smith, Attleboro, Mass., assignor to Ernst Gideon Bek, Pforzheim, Germany.

The herein described improved steps in the process of continuously electroplating metal sheets in strip form, which comprise moving through and out of a plating bath two metal sheets compressed together in flush relationship throughout their width so that they form a single compressed sheet of substantially the sum of their thicknesses during immersion in said bath, said sheets forming the cathode of said bath, whereby said sheets may each be plated on the outer exposed side thereof only and after withdrawal from the plating bath separating said sheets.

1,819,291. August 18, 1931. **Method of Annealing Sheet Copper.** George A. Hempstead, Lisbon, Ohio, assignor to the National Brass & Copper Co., Lisbon, Ohio.

The method of heating sheet copper, which consists of passing such sheet continuously through an open ended tunnel furnace, and heating the sheet therein by enveloping it in impinging jet flames of fuel gas to which oxygen for supporting combustion is supplied by air entering the open end of the tunnel.

1,819,603. August 18, 1931. **Electroplating Apparatus.** James W. Hughes, Philadelphia, Pa., assignor to Budd Wheel Company, Philadelphia, Pa.

In an electroplating apparatus, in combination, a tank adapted to contain an electroplating solution, a trough extending longitudinally along the bottom of said tank, the opposite ends of said trough being curved upward toward the upper edges of the tank and the bottom of said trough between the curved portions thereof being corrugated.

1,819,607. August 18, 1931. **Method of Treating Waste Alloys for the Purpose of Removing Therefrom Certain Constituents Whose Presence Renders the Alloys Unsuitable for Certain Uses.** Paul Kemp, Vienna, Austria.

In the method of separating copper from copper-containing alloys of lead and other metals, the step which consists in treating the alloy melt with a substance of the class containing silicon, its alloys and all the constituents together of a silicon alloy.

1,819,722. August 18, 1931. **Process for Composite Casting.** Ihei Sugimura, Shiba Ku, Tokyo, and Kwanichi Magarisawa, Tsurumi Ku, Yokohama, Japan, assignors to Meiji Yasumoto, Yokohama, Japan.

A process for casting two different kinds of metals with one metal acting as a core and the other metal as a surrounding sheath, said metals having the property of not alloying with each other, one metal having less specific gravity, higher melting point and greater surface tension than the other and the other metal being provided with moderate adhesive power to the former, and having a good fluidity and being adapted to form a strong sheath when solidified.

1,820,465. August 25, 1931. **Buffer Wheel.** Alexander Levett, Hendersonville, N. C.

A buffer wheel, comprising a plurality of cloth disks arranged in side by side relation, applied cloth squares upon each side of the wheel arranged to have the threads thereof extend on a bias to the threads of the adjacent disk, and a second cloth square applied over each of the first mentioned squares and arranged to have the threads thereof extend parallel to the threads of the adjacent disk.

1,821,105. September 1, 1931. **Method of Cleaning Galvanizing Pots.** Frank L. McMeans, Apollo, Pa., assignor of one-half to Philip B. Doverspike, Vandergrifts, Pa.

In the maintenance of a molten bath of hot galvanizing metal, the method of eliminating dross which lies in a stratum beneath said galvanizing metal, which method comprises the steps of lowering an endless conveyor through the bath of galvanizing metal and into said stratum of dross, causing actuation of said endless conveyor and effecting a progressive removal of the dross with included galvanizing metal upwardly through said bath, and effecting, during such progressive removal of dross.

1,821,643. September 1, 1931. **Removal of Tin from Antimonial Lead and Alloy.** Thomas Delbert Jones, Perth Amboy, N. J., assignor to American Smelting and Refining Company, New York, N. Y., a corporation of New Jersey.

The process of removing tin from metals containing tin as an impurity, which comprises heating the mixture substantially above the fusion point thereof and stirring air into the bath whereby the tin is oxidized and forms a dross which floats on the surface, removing the dross and removing tin therefrom, and continuing the operation until the tin content is reduced to the desired point.

1,822,596. September 8, 1931. **Abrasive Compound.** Robert S. Leather, Waterbury, Conn., assignor to the Lea Manufacturing Company, Waterbury, Conn.

A solid abrasive preparation comprising a mixture of glue, water, abrasive, and an agent which is physically associated with said glue for raising the softening temperature of the mixture, said preparation being readily transferable to a buffing or polishing implements by rubbing.

1,823,645. September 15, 1931. **Apparatus for Cleaning Polishing Wheels.** John J. Cunningham, Dayton, Ohio, assignor of fifty-one per cent (51%) to Melrose G. Kopf, Dayton, Ohio.

In an apparatus for cleaning the cores of polishing wheels and the like, a casing to enclose a wheel having an outer portion which is to be removed, means for heating said article while it is within said casing to soften said outer portion, and means for rotating said wheel within said casing at a high speed to cause the softened portion thereof to be thrown off by centrifugal force.

1,823,864. September 15, 1931. **Process of Obtaining Beryllium and Aluminum Compounds.** Charles B. Sawyer and Bengt Kjellgren, Cleveland, Ohio, assignor to the Brush Beryllium Company, Cleveland, Ohio.

In a process of extracting beryllium from beryl, the step which consists in melting the beryl.

As a new and useful product, beryl which has been heated at a temperature above 1000° C. and rapidly cooled and thereby had its reactivity substantially increased.

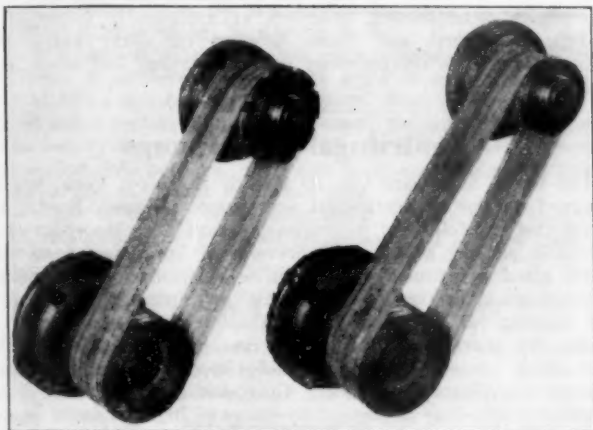
Equipment

New and Useful Devices, Metals, Machinery and Supplies

Variable Speed Multi-V Drive

Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich., announces the development of a new type of machine drive for which a number of distinctive advantages are claimed. The new product is known as the Variable Speed Multi-V Belt Drive. It consists basically of a pair of belted pulleys capable of transmitting up to 15 h.p. This has a ratio of 1 1/3 to 1, and greater ratios are possible if two or more pulleys are used. It is possible to provide an unlimited number of speeds within this ratio, the maximum revolutions per minute recommended by the manufacturer being 3,000.

It is claimed as an outstanding advantage that these pulleys can



New Hammond Variable Speed Drive

be used by the V-belt. The new drive is said to take up little room—no more than an ordinary V-belt pulley; it is simple in construction; offers a wide range of speed changes.

The drive was developed for use with polishing, buffing and grinding machinery manufactured by the Hammond company. Speeds of 2,000 to 3,000 r.p.m., or 1,800 to 2,700 r.p.m., can be provided, changes from one speed to another requiring a negligible amount of time. It especially is desirable where polishing and buffing are done on one machine, or where efficiency of wheels is desired despite wear and consequent decrease in diameter. It is also recommended for high speed grinders where wheel periphery speed must be maintained despite wear. A speed range of 1,600 to 2,400 r.p.m. in the drive for machines using 24-inch wheels, to maintain a constant periphery speed of 9,500 on the wheel until it is worn to 13 inches in diameter. Any speed in the range can be secured.

The drive is especially recommended to makers of equipment to which such a variable drive could be applied. Readers will obtain full information upon direct application to the company.

Refractory Cement

Quigley Company, Inc., 56 West 45th Street, New York, has placed on the market "Pyro-Mortar," a new dry refractory cement for which a number of claims of superiority are set forth by the manufacturer. It is intended for use wherever a dry cement is needed, as in bonding fire brick, for plaster coatings, pointing up cracks and reclaiming eroded furnace walls, etc. It is stated to be a slow-setting cement which gains strength under heat. The maker claims it is remarkably stable and practically neutral as to

expansion and contraction, and that it will not check, crack, shrink or swell after drying, or in service. High refractory qualities, uniformity, good plasticity and conformity to tests specified by the Bureau of Standards are mentioned as further proofs of its quality. Complete information is contained in a bulletin on "Pyro-Mortar" which readers can obtain by applying directly to the company.

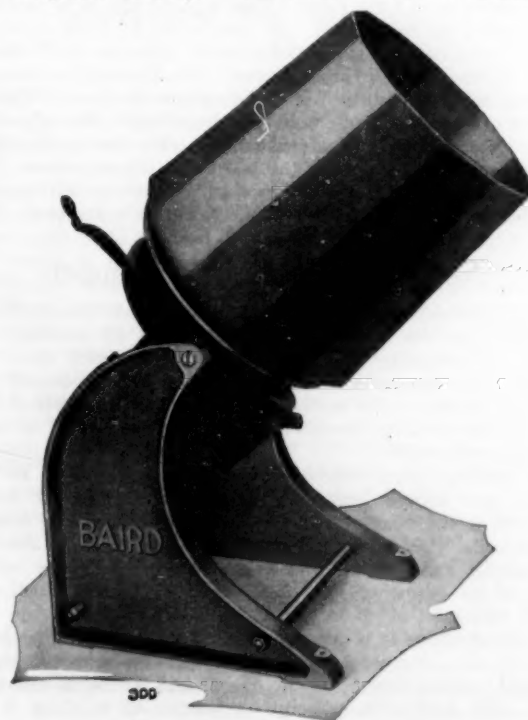
Small Ingot Molds

An engineering survey of the use of "Vulcan" small ingot molds at the plant of the International Nickel Co., Inc., Huntington, Va., has been issued by the A. C. Nielsen Co., Chicago, Ill. The survey indicates that these molds manufactured by the Vulcan Mold and Iron Co., Latrobe, Pa., have proven to be a very superior product. It is stated that the nickel company uses solid type molds, 14 x 14 in. square and 60 in. long. These are tapered 1 inch in 60, and cast a 3,250 lb. ingot of nickel or Monel metal, including hot top. Preheated molds are poured at temperatures of 2,750°F., and 2,850°F. The metals have a highly corrosive action tending to curtail mold life.

Examination of 23-months records covering 560 molds, the Nielsen survey states, that the average net cost per "Vulcan" mold was \$79.97 as against \$76.96 for other makes. The average net cost per filling was \$1.27 for "Vulcan" molds, as against \$1.35 for other makes. On 172 "Vulcan" molds used in one year, a saving of \$868.60 was effected, as compared with other makes used.

New Oblique Tumbling Barrel

The Baird Machine Co., Bridgeport, Conn., announces the introduction of a new motor-driven oblique tilting tumbling barrel, to be designated Model A. The maker states the machine has



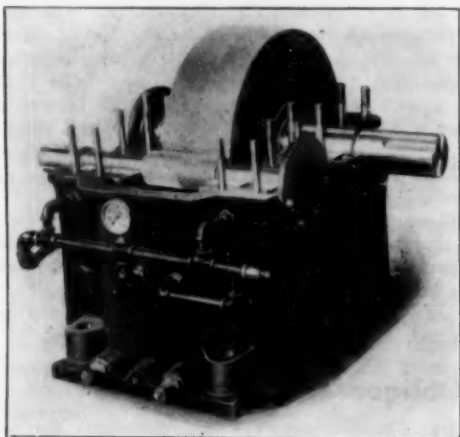
New Baird Tumbler

been designed to operate economically and occupy a minimum of space. Advantages claimed for the new machine include ability to tilt to most efficient angle and quick and easy loading and unloading. The barrel is mounted on a plate which is secured to a shaft driven by a fully-enclosed $\frac{3}{4}$ h.p. horizontal, geared head motor. Motor is mounted between the legs. Overload breaker and snap switch are provided. The motor acts as counterweight for the barrel. Barrel shaft is mounted on ball bearings and is geared direct to motor, minimizing friction and reducing power consumption to minimum. Barrel is tilted by manual crank with worm and sector, and is stated to be easy and safe.

Readers will obtain full information by applying directly to the manufacturer.

High Speed Gear Unit

Farrel-Birmingham Co., Ansonia, Conn., and Buffalo, N. Y., announces the development of a new type of gear unit suitable for increasing the speed of the driven unit as well as reducing the speed. These units are stated to be especially adapted for connecting Diesel or gas engines to high speed centrifugal pumps and similar service. The unit has been designed to supply requirements which have hitherto been considered special such as in steam



New
Farrel-
Birmingham
Gear Unit
for
Increasing
or Reducing
Speed

turbine service where gear units are needed for operation at pinion shaft speeds over 1,800 r.p.m. This type of unit is available in a standardized series suitable for speeds up to 6,000 r.p.m., and powers from 120 h.p. to 2,500 h.p., with ratios up to 10 to 1 for either increasing or reducing speed. The illustration shows one of these units with cover removed to show the Farrel-Sykes heringbone continuous tooth type gears employed. Complete lubrication system is provided, together with oil cooler consisting of a coil of copper pipe placed in the bottom of the gear case. W. E. Sykes is the designer of the product. Complete information is available to readers on direct application to the company.

New Wire Cutter and Stripper

Artos Engineering Company, 327 East Brown Street, Milwaukee, Wis., has for some years manufactured an automatic wire cutting and stripping machine of the floor-mounted type. This company now announces the addition of a bench-mounted model to fill the demand for a moderate priced machine for plants where production is not large enough to warrant installation of the larger, floor-mounted model.

The bench-mounted machine automatically measures and cuts wires to any desired length within the range given for the machine, and in the same operation will strip the insulation from one or both ends. The change from one cutting length to another is very simple, and requires the adjustment of one lever only by means of an adjusting nut. The stripping length is adjustable from a minimum of $\frac{1}{8}$ in., to a maximum of $1\frac{1}{2}$ in., on either end. The machine is primarily designed for short cutting lengths up to 15 in.; however, attachments can be supplied whereby maximum cutting lengths of 30, 45, 60 and 90 inches can be obtained. The production capacity for lengths up to 15 in. is 3,000 pieces per hour; for longer lengths the capacity varies from 1,500 pieces per hour between 15 and 30 inch lengths, and down to 500

pieces per hour for lengths from 60 to 90 inches. The machine will handle all sizes of wire up to No. 12 B. & S. gauge.

The bench-mounted model is particularly well adapted for radio manufacturing plants, and for electrical manufacture, where demand is for short lengths and light wires, the maker states.

"Leadhesion" Coating Process

The application of a permanently-adhering lead coating of any desired thickness to metal surfaces as a protection against corrosion is now being handled at the Gross Engineering Corp., by means of their latest development in lead-fusion methods, the "Leadhesion" process. The fact that the "leadhesion" process is just as easily and effectively employed in the installation of large and small work in the field as it is in the regular shop work makes it peculiarly applicable to the wide range of tanks, vacuum and pressure vessels, and moving parts of acid- or brine-proofed machinery, etc., in which the Gross Engineering Corp., specializes, most of which have to be coated in position, the company states. A number of the leading chemical, papermaking, oil-refining and other industrial plants handling corrosive materials or fumes are now specifying the "Leadhesion" process wherever exceptionally difficult conditions are to be met, it is claimed. One of these cases is that of protecting the blades of agitators, fans and centrifugal blowers which are exposed to corrosion.

The "Leadhesion" process was invented by Louis Gross, president of the company. It embodies refinements of technique over his original lead coating processes as successfully employed in Europe and North and South America for many years. Mr. Gross is a recognized authority on lead burning and other lead-fusion problems.

Centrifugal Acid Pumps

The U. S. Stoneware Co., 50 Church St., New York, has redesigned its line of centrifugal acid pumps (ceramic-lined), and states that the following improvements have been incorporated:

Double packing gland which prevents all spraying. Semi-automatic gland adjustment. Temperature compensation to maintain constant gland pressure. Accessibility permitting the removal of any wearing part in ten minutes. Absolute standardization of all parts. All stoneware parts ground into protecting armor rather than being cemented in. Adjustable impeller clearances. Dual impeller providing gland relief. Corrosion resistant alloys in all metal parts that may be injured by fumes of highly volatile liquids. Timken bearings which may be taken up without altering impeller alignment. Material reduction in floor space for a given pump



New "U. S." Centrifugal Pump

capacity. An overall efficiency equal to similarly sized pumps for water service.

A large diagram showing the design of this company's standard centrifugal acid pump is obtainable, along with full information, by application to the manufacturer.

New Potentiometer Pyrometer

An improved potentiometer pyrometer, known as "Micromax," was announced in September by the Leeds & Northrup Company, Philadelphia, Pa. It is said to be an instrument for pyrometer users who require pyrometer reliability in its highest form.

In "Micromax," the potentiometer pyrometer is raised to a new high level of accuracy, reliability and strictly automatic operation. It requires no manual adjustments, or daily attention; eliminates the "human element" in operation. The circuit is standardized automatically, every 45 minutes or less, giving closer adjustment than is obtained manually. Manual adjustment of the stepping

action is not necessary, "Micromax" being fully automatic, the maker states.

By virtue of a microscopically sensitive balancing device, "Micromax" can detect and record deflections of the galvanometer pointer amounting to 1/1000th of an inch. If necessary, the recording pen, or print wheel, can step across the entire chart in less than 22 seconds, the size of each step being closely related to the extent of galvanometer pointer deflection.

"Micromax" is put forward by its makers as a basic contribution to the advancement of industrial pyrometry. All models of "Micromax" are in full production. All models are available in the usual schedule of deliveries. A new catalog, No. 87, describing the instruments in detail, has been issued and will be sent to readers upon request to the company.

Zinc Slinger for Hot Galvanized Work

A method for improving the appearance of hot galvanized work, assuring a more uniform protective coat and eliminating excess zinc from places where it would seriously hamper the function of the part, has been in operation in the Pittsburgh plant of Hubbard & Company for a sufficient length of time to demonstrate its complete success, according to N. Ransohoff, Inc., Cincinnati, Ohio.

High standards of quality prevail in the plant of this manufacturer of pole line hardware, and inspection is minute. Scale is removed from parts previous to machining by the use of "Ideal" tumbling barrels. From the zinc kettles the parts are fed into a "zinc slinger" installed by N. Ransohoff, Inc.

The first section of this machine is a slanting hooded barrel, gas heated, of perforated metal; its angle is adjustable; it revolves at 50 r.p.m. As the work "dances" through, excess zinc is removed and is reclaimed in a chute beneath the hood. Parts travel into a larger drum, revolving slowly in water. This process quenches, but does not cool. The zinc is set and the finished parts are discharged, to dry of their own heat.

The result is said to be a better finish, elimination of surplus zinc on threaded work, increased production, and lowered costs.

New Finish Grinding Wheels

The Carborundum Company, Niagara Falls, N. Y., announces the development of a new type of grinding wheel by means of which grinding can be done to an extremely lustrous finish. The company states that finishes can be produced with these wheels which are even finer than the best hitherto produced by lapping with compounds or so-called loose grain agencies. The new Carborundum product is a solid wheel made up of the finest and most

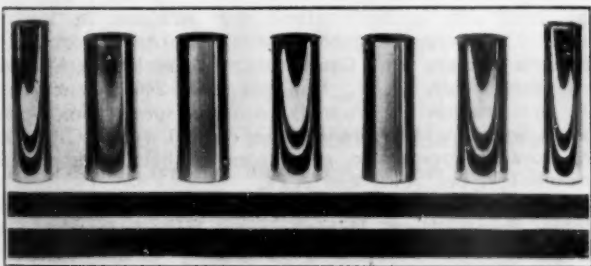


Photo Showing Comparative Surfaces on Bar Steel Ground by Several Methods.

uniform grains and grits. Both "Aloxite" and "Carborundum" are used. A special bond was developed, due to the use of extremely fine abrasive.

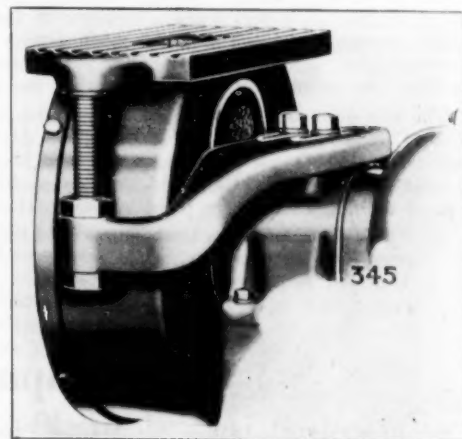
The illustration here is stated by the company to be an absolutely unretouched photograph showing various types of finish on steel pins. In order to show a comparison of these finishes two strips of ordinary blue print paper were placed in front of the pins and reflected in the surfaces. At the extreme left of the photograph is a pin ground with the new type of finishing wheel. This same finish is shown on the pin in the center of the group, and also on the pin at the extreme right. The sixth pin from the left has what is termed an "ultra" finish, the highest and finest obtainable before the advent of the new wheel, according to the company. The second and third pins from the left carry, re-

spectively, what are termed finishes Nos. 1 and 2. The fifth pin carries finish No. 3.

On two of the pins there is no reflection of the blue print paper strips. The second pin from the left shows just a faint reflection. The two pins on the ends and the one in the center, all ground with the new type finishing wheel, give almost perfect reflections, indicating the perfection of their finish—a finish which for the want of a better term is being called "super-ultra." The Carborundum Company states that there has been no attempt to favor the "super-ultra" finished pins used in this comparison in any way.

Surface Grinding Attachment

Hisey-Wolf Machine Co., Cincinnati, Ohio, announces a new surface grinding attachment. The maker states that this, as a complete unit, is interchangeable with standard wheel guard equipment, and can be mounted on either right or left side of the machine. The table is adjusted to wear of wheel through two husky square thread screws rigidly locked in place by means of two



New
Hisey-Wolf
Surface
Grinding
Attachment

opposed nuts. The guard cover is readily removable for replacement of wheel. Both the guard and cover are constructed of steel. The rugged table, 10 x 21 inches, is self-cleaning and of generous proportions.

Gas-Heated Soldering Iron

Increased efficiency and greater economy are two of the outstanding advantages claimed for the new "Torchiron," a gas-heated soldering iron recently introduced by the Reliance Specialties Manufacturing Company, 122 East 42nd Street, New York. Using the Torchiron, the operator has a continuously heated soldering iron for steady work.

Low gas consumption is assured by the manufacturer. With the 3 lb. head, the fuel required is only 4 or 5 cu. ft. of gas per hour, and with the 5 lb. head, 5 or 6 cu. ft. of gas per hour. This iron is heated by either natural or artificial gas and low pressure air mixed by means of a needle valve, and passing through a flexible hose to the handle of the torch. Constant temperatures are increased or decreased at the option of the operator by regulation of the needle valve. The copper heads may be brought to a red heat within 3 to 5 minutes after lighting. A great deal of the filing and cleaning, dipping and retinning of the coppers is eliminated, inasmuch as the copper heads are not exposed to the open flame. Coppers are available in sizes ranging from 1/2 to 5 lbs. They also are made to specifications. The coppers are quickly interchangeable, being screwed onto the stainless steel tip. As the name implies, the "Torchiron" may be used as a torch as well as an iron, merely by removing the copper head.

Synchronizing Alternators

The Ideal Electric & Mfg. Co., Mansfield, Ohio, has developed a synchronizing alternator designed to synchronize two engines to make them run at the same constant speed and to produce torque efforts in unison. Several recent installations on twin screw vessels introduced surprising improvements in smoothness and engine performance, it is stated. C. F. Kettering, president of General

Motors Research Laboratories, was the first to install synchronizing alternators on his yacht.

The alternators are mounted in place of the flywheels one on each of the two engines which may be gas, oil, or steam driven. They are connected together through the "Ideal" control board, and not only induce the engines to run at the same constant speed, but to transmit their torque impulses to the shafts exactly in unison, which adds greatly to the smoothness of operation. Patent applications have been made covering all features of this development.

The makers state that there are many other applications where it is often desirable to synchronize engines and other machinery, and this latest addition to the "Ideal" line supplies a very satisfactory solution.

New Alloy for Battery Plates

The enlargement of the battery plate market in the Cleveland district is foreseen as the direct result of the discovery of a new alloy for battery metal. This announcement will particularly interest dealers as it represents a new outlet for the sale of salvaged battery plates. The alloy, when combined with salvaged battery plates, produces a new battery metal with several unique qualities that promise an immediate market, the makers state.

The new alloy is a discovery of the research laboratories of the Master Builders Company, Cleveland, Ohio, dealers in metal specialties. Although the manufacturers have factories in Buffalo, Irvington, Toronto and Cleveland, the new metal will be produced only in the new and modern plant in Cleveland for the time being.

According to an announcement by S. W. Flesheim, president of the Master Builders Company, production started in October, with E. A. Newman as general manager.

Cleaning and Coating Stove Parts

In the Cleveland plant of the American Stove Company is a very interesting installation of equipment for cleaning and japanning stove parts in one continuous operation with maximum speed and a minimum of handling. This equipment was designed and installed late in 1927 by The Paul Maehler Company, Chicago, Ill., builders of japanning, baking and drying ovens for industrial and laboratory use. Natural gas is an essential feature of the installation, being used for drying the parts prior to coating, and for baking on the enamel or japan, as the case may be.

The equipment occupies factory space of approximately 20 x 175 ft. and is 21 ft. high. It consists of a washing compartment for cleaning and rinsing, a drying compartment, a dip tank, a two compartment baking oven, and two continuous conveyors which carry the work without interruption or rehandling through the various operations and deliver the finished parts ready for assembly into completed stoves. Pieces handled are various stove parts, sides, tops, plates, and numerous small parts of miscellaneous sizes and shapes. One half section is used for continuous cleaning, drying, dipping and baking, the other half for continuous dipping and baking, with unload at same end.

The method of handling is by hooking the parts to two strand bar flight conveyors which operate at approximately 16 in. per minute, carrying the parts through the various operations.

It is claimed that with the Maehler installation seven operators turn out finished work which formerly required from twenty-five to thirty-five operators using hand dip methods and stationary oven equipment. Another comparison shows that five men operating the Maehler oven accomplish in two days' work which formerly required eleven men to turn out in six days.

Readers desiring more complete information on the process should apply directly to the Maehler company.

Equipment and Supply Catalogs

Synchronizing Alternators for Marine Power. Ideal Electric & Mfg. Co., Mansfield, Ohio.

Flexible Coupling. Clark Coupling Company, 149 Church Street, New York. Illustrated circular.

Refractory Cement. Quigley Co., Inc., 56 W. 45th Street, New York. Illustrated bulletin on "Pyro Mortar," a dry refractory cement.

Air in the Automotive Industry. Paasche Airbrush Co., 1909 Diversey Parkway, Chicago, Ill. Illustrated bulletin on spraying equipment.

Electric and Fuel Furnaces. W. S. Rockwell Co., 50 Church St., New York. Illustrated leaflet on furnaces for nonferrous metals and other purposes.

Sheet Carrier. United Engineering & Foundry Co., Pittsburgh, Pa. A carrier or sling for handling sheet packs, piles and sheet-bar piles and similar material.

Temperature Control. The Bristol Co., Waterbury, Conn. Catalog 2050, Pyrometer Controllers; Catalog 2025, Thermometer Controllers. Each is fully illustrated.

Deposition Process. Fescol, Ltd., 101 Grosvenor Rd., Westminster, London, S. W. 1, England. Bulletin on a plating process for corrosion prevention and decoration of metals. Illustrated.

Heat Treatment of Steels with Cyanides and Salts. Roessler & Hasslacher Chemical Co., Empire State Bldg., New York. An 80-page booklet giving complete scientific data on the subject, with considerable new material.

Multi-Speed Drive. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Bulletin L.20520, on the Westinghouse-Wise $\frac{1}{2}$ to 15 h. p. drive for instant speed changes; all commercial frequencies and voltages.

Electric Furnaces. General Electric Co., Schenectady, N. Y. Bulletin GEA-1146A, 24 pages, illustrated. Complete descriptive data on G. E. electric furnaces for various uses including heat treating, annealing, hardening, etc.

Worthington Pump & Machinery Corp., Harrison, N. J., has issued a number of new catalogs, bulletins, etc., on pumping equipment of various types. A list is available on request

to the company. Also Worthing Multi-V Drive, an 8-page pamphlet.

Power Transmission. E. F. Houghton & Co., Philadelphia, Pa. A new 148-page treatise on "Vim" belts, with full engineering data, numerous tables and charts. Covers drives ranging from 5 to 100 h. p. Copies should be requested from the company on firm stationery.

Tube Equipment, Heat Coils, Etc. Parker Appliance Company, 10320 Berea Road, Cleveland, Ohio. Bulletin 28, Tube Fabrication; No. 29, Condensation Coils; No. 32, Pad Tube Couplings. Each includes considerable technical and practical data. All in leaflet form for inclusion in looseleaf binder.

Electric Motors and Generators. General Electric Company, Schenectady, N. Y. Bulletins GEA-246C, general purpose synchronous; GEA-560B, constant-speed, single-phase, type SCR; GEA-1475, single-phase vertical, type SCR; GEA-1483, medium-speed, a. c. generators for belt drive or direct connection, types ATB and ATI.

Metal Cleaner. Philadelphia Quartz Company, Philadelphia, Pa. "Sodium Metasilicate, a New Industrial Alkali for use in the Electroplating Industries," is a booklet containing a technical paper by W. L. Pinner, chemical engineer, of Columbus, Ohio. It gives a clear explanation of the use of sodium metasilicate, or "Metso Crystals," which is the brand name for the above company's sodium metasilicate, heretofore sold without brand name.

Rolled Zinc and Die Castings. Manufacture and Finishing. The New Jersey Zinc Company, 160 Front Street, New York. Three publications worthy of the attention of all who are interested in producing or finishing zinc die cast products. "The Plating of Rolled Zinc and Zinc Die Castings" is a 17-page illustrated booklet by E. A. Anderson and C. E. Reinhardt of the company's research division. It fully covers its subject. "Procedure for Plating Rolled Zinc and Zinc Die Castings" is a card giving complete directions for electroplating; it is reproduced elsewhere in this issue of METAL INDUSTRY, and is also obtainable in card form from the company. "Zinc Die Castings" is a booklet showing the wide diversity of products that are being made of zinc die castings.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

New York Branch

HEADQUARTERS, CARE OF J. E. STERLING, 2581 46TH STREET, ASTORIA, L. I.

A regular meeting of the New York Branch was held Friday, October 9, at the World Building. President Ralph Liguori called the meeting to order. All officers were present. President Liguori appointed the following committee for the coming banquet: John Rolff, John Sterling, William Fischer, Harry Friedbaum, Dennis Kelly and Joseph Musante, Jr.

Adolph Bregman, managing editor of THE METAL INDUSTRY, paid the New York Branch a friendly visit. President Liguori called upon Mr. Bregman for a few remarks. Mr. Bregman stated the benefits that the branches of the American Electro-Platers' Society can obtain by publication of their activities in the trade journals.

There were discussions of chromium plating and zinc galvanizing solutions.

JOSEPH MUSANTE, JR., Recording Secretary.

Philadelphia Branch

HEADQUARTERS, CARE OF J. E. UNDERWOOD, 327 NORTH 10th STREET, CAMDEN, N. J.

Annual Banquet, November 21

The Philadelphia Branch of the American Electroplaters' Society will hold its annual educational session and banquet November 21, at Adam's, 13th and Spring Garden Streets, Philadelphia. The session will begin at 3 p. m., and the banquet at 7 p. m. A good program of papers has been arranged, as follows:

MANUFACTURE OF PHONOGRAPH RECORDS, R. A. Dimon, RCA-Victor Co., Camden, N. J.

ANODIC TREATMENT OF ALUMINUM, Edwin Joyce, Navy Yard, Philadelphia, Pa.

PREPARATION OF STEEL FOR ELECTROPLATING, George B. Hogaboom, Hanson-Van Winkle-Munning Co., Matawan, N. J.

PLATING OF CHROMIUM AT HIGH CURRENT DENSITIES, L. A. Willink, Frankford Arsenal, Philadelphia, Pa.

Some surprises are promised by Joe Dineen and his door prize committee. There will be the usual fine dinner and good music. Tickets are available from George Gehling, 5001 Tulip Street, Philadelphia, Pa. All members and branches of the Society are urged to attend and bring friends.

Heating and Ventilating Exposition

CLEVELAND, OHIO. JANUARY 25-29, 1932

The Second International Heating and Ventilating Exposition will take place under the auspices of the American Society of Heating and Ventilating Engineers, at Cleveland, from January 25 to 29, 1932. Every type of heating and ventilating equipment will be displayed. Of interest to the metal trades will be the unit heaters and non-ferrous metal radiation exhibits; air conditioning apparatus; the use of aluminum in conjunction with lead alloy in expansion devices for masonry anchorage; furnace air filters.

Ohio Foundries Association

HEADQUARTERS, 443 PENTON BUILDING, CLEVELAND, OHIO

A series of meetings has been held in all sections of Ohio preparatory to launching the Ohio Foundries six-month safety campaign, in an effort to reduce the number of foundry accidents and secure a lower state industrial insurance rate next year.

State statistics reveal that there were 9,012 foundry accidents last year, 26 of which were fatal.

Copper and Brass Research Association

HEADQUARTERS, 25 BROADWAY, NEW YORK

The eleventh annual meeting of the Copper and Brass Research Association was held at its offices, 25 Broadway, New York, on October 8. R. L. Agassiz, Chairman of the Board of the Calumet & Hecla Consolidated Copper Company, Boston, Mass., was re-elected president. Vice-presidents elected were: F. S. Chase, Louis S. Cates, H. Donn Keresey, C. D. Dallas. C. T. Ulrich was elected treasurer; H. Foster Bain, managing director; William A. Willis, manager; Bertram B. Caddle, secretary.

A large number of copper mining and smelting companies are members of the Association. There are also a number of copper and brass fabricating and distributing companies. The latter are the following:

The American Brass Company.

Bridgeport Brass Company.

Chase Brass & Copper Company.

T. E. Conklin Brass & Copper Company, Inc.

Foster Wheeler Corporation.

New England Brass Company.

The J. M. & L. A. Osborn Company.

Revere Copper & Brass, Incorporated.

John A. Roebling's Sons Co. (Woven Wire Fabric Division).

Scovill Manufacturing Company.

Wolverine Tube Company.

The Electrochemical Society

NEW YORK SECTION HEADQUARTERS, CARE OF W. W. WINSHIP, THE THERMAL SYNDICATE, LTD., 58 SCHENECTADY AVENUE, BROOKLYN, N. Y.

The fall meeting of The Electrochemical Society, New York Section, will be held on November 20, 1931, at 8:00 p. m. at Pratt Institute, Ryerson Street near Willoughby Avenue, Brooklyn, N. Y. Non-members will be welcomed. The program of papers is as follows:

"The Debye-Hückel Theory: its present status, its value and its limitations in calculating the activities of electrolytes," by Dr. Victor K. La Mer.

"Some economic aspects of the electro-chemical industries," by Dr. Charles L. Mantell.

Discussion of these papers is invited. Supper preceding the meeting will be served at 6:45 p. m., in the Institute cafeteria at \$1.00 per person. Ladies are welcome both to the dinner and to the meeting. An opportunity will be given to inspect the chemical laboratories of the Institute.

Associated Brass Founders of New England

HEADQUARTERS, CARE OF HERBERT H. KLEIN, 310 CONGRESS STREET, BOSTON, MASS.

A regular meeting was held at the Engineers' Club, Boston, on September 23. W. J. Sweet and C. A. Crawford, International Nickel Company, presented papers on applications of nickel to the brass foundry industry. Discussion of the subject followed the addresses.

Iron, Bronze and Wire Manufacturers

The National Association of Ornamental Iron, Bronze and Wire Manufacturers held its annual convention October 6 to 9, at Atlantic City, N. J.

Association of Waste Material Dealers

HEADQUARTERS, TIMES BUILDING, NEW YORK

On October 27th and 28th the Salvage and Reclamation Division of the National Association of Waste Material Dealers, Inc., will hold a conference at the plant of the General Electric Company, Schenectady, N. Y., which company will act as host to members of that group and their guests. The purpose of the conference is to consider and discuss problems arising in connection with salvage and reclamation operations in large industrial plants. Papers will be presented on important subjects not only involving the disposition of waste materials, but the question of keeping industrial plants clean from surplus and obsolete equipment.

R. W. Phillips, manager of the salvage and reclamation division of the duPont Company, is chairman of the group, and C. H. McKnight is handling all the details for the General Electric Company.

On the evening of October 27th members and guests will be tendered a dinner at the Van Curler Hotel by the General Electric Company, and officials of that company are expected to address them.

International Acetylene Association

HEADQUARTERS, 30 EAST 42ND STREET, NEW YORK

The most comprehensive discussion ever given of methods for testing oxy-acetylene welded joints will be a feature of the thirty-second annual convention of the International Acetylene Association at the Congress Hotel, Chicago, November 11, 12 and 13. At the weld-test session, November 11, at 8:15 p. m., Prof. H. L. Whittemore, of the United States Bureau of Standards, will

speak on the importance of tests to welders and to users and makers of welded products. There will be a dramatized demonstration of visual and stethoscopic tests; hammer, bending, tension and hardness tests; invisible-ray tests; specific gravity, compression, and internal pressure tests. Among the speeches at this session will be "Today's Opportunities for Welding—Trained Men in the Metal Working Trades and Industries," by Dr. S. Lewis Land, educational director of the Heating and Piping Contractors' National Association; and "Training Gas Welders for the Job," by Thomas Jones, superintendent of welding for the Illinois Steel Company.

American Institute of Architects

HEADQUARTERS, 386 FOURTH AVENUE, NEW YORK

Nineteen groups of the construction industry, with more than 100,000 members, and representing billions in capital, have formed an alliance "to co-operate for the common good of the industry and better to serve the nation," it is announced by the American Institute of Architects. Robert D. Kohn of New York, president of the Institute, has been chosen general chairman of the provisional organization, which will be known as the Construction League, the scope of which embraces a vast army of workers, including the Building Trades Department of the American Federation of Labor.

A large number of organizations have been drawn into the combination. These include mainly associations representing various lines within the building and construction field. The metal lines are represented by the National Association of Ornamental Iron and Bronze Manufacturers, and the National Association of Sheet Metal Contractors.

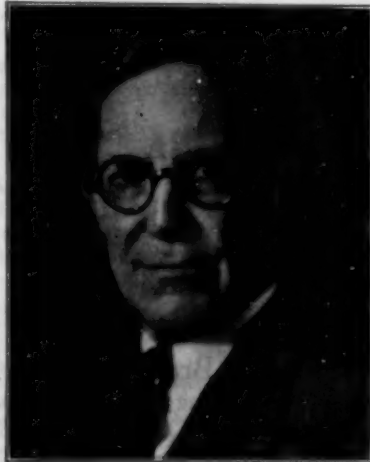
Personals

Arthur Barrett Parsons

Arthur Barrett Parsons has been elected secretary of the American Institute of Mining and Metallurgical Engineers, to succeed Dr. H. Foster Bain, who is resigning, effective November 1.

Mr. Parsons has been assistant secretary of the Institute since 1929. Born about 44 years ago at Salt Lake City, Utah, he attended the preparatory schools there and entered the Utah School of Mines, emerging in 1909 as a Bachelor of Science in Mining Engineering. He became, during the years following his graduation, mill superintendent for the Candor Mines Company; smelter foreman for Burma Mines, Ltd., Burma, India; mining engineer for the Butte and Superior Mining Company, Butte, Mont.; associate editor of Mining and Scientific Press, San Francisco; associate editor of Engineering and Mining Journal, New York; president of the Mineral Research Corporation, New York. Besides his assistant-secretaryship of the Institute during the past two years, he has been a contributing editor of Mining and Metallurgy. He is the author of more than 100 special articles on technical and economic phases of the mining industries. He is a member of the Institute, and also of the Mining and Metallurgical Society of America, the Mining Club and the Engineers Club, New York.

In accepting the position as successor of H. Foster Bain, Mr.



A. B. PARSONS

Parsons expressed his appreciation of the confidence of the Institute in him, and declared that if he "could fill Dr. Bain's shoes only 75 per cent" he would be gratified. He has in reality been filling Dr. Bain's shoes for about a year; practically the complete secretaryship has been in his charge since December, 1930, when Dr. Bain received a leave of absence to do special work for the Copper and Brass Research Association, with which he has now become permanently identified.

Mr. Parsons was married in 1915 to Miss Mary Snell. He has two children, both boys.

Herbert C. Beik, 21 East 40th St., New York, has been made eastern states representative of Alfred Fisher Furnaces, Inc., Cicero, Ill., producers and distributors of foundry equipment and supplies.

Dr. A. J. Phillips, formerly metallurgist with the Scovill Manufacturing Co., Waterbury, Conn., is now superintendent at the Central Research Laboratory of the American Smelting and Refining Co., Maurer, N. J.

Harry J. Hater, vice-president and general manager of Aluminum Industries, Inc., Cincinnati, Ohio, has been appointed a member of the manufacturers' divisional committee of the Standard Parts Association, Detroit.

A. B. Ely, formerly chief engineer of the Bassick Company, Bridgeport, Conn., manufacturer of metal furniture hardware and trimmings, casters, etc., has joined M. H. Rhodes, Inc., Hartford, Conn., as chief engineer. Latter firm manufactures switches.

Torolf Krogvig is visiting in this country to acquaint himself with American foundry methods and equipment, and with systems of instruction in technical schools. His headquarters in this country are at 2877 Fernwald Road, Squirrel Hill, Pittsburgh, Pa., in care of Ruud Larsen. Mr. Krogvig is manager of the foundry department of the Technological Institute of Norway at Oslo.

Thomas W. Pangborn, president, Pangborn Corporation, Hagerstown, Md., recently served as chairman of the committee of three directors of the Hagerstown Bank & Trust Co.,

who raised \$1,000,000 to strengthen the institution. The undertaking was accomplished in three days and followed the closing of two banks in Hagerstown, and two others in the county the week preceding.

Benjamin B. Thayer, vice-president of Anaconda Copper Company has been appointed a divisional chairman of Non-Ferrous Metals Committee of the Commerce and Industry Division of the Emergency Unemployment Relief Committee in New York City, it was announced recently by Harvey D. Gibson, chairman of the relief body. The Emergency Unemployment Relief Committee has opened a campaign to raise \$12,000,000 for the relief of the 750,000 unemployed in New York City. Mr. Thayer will organize a committee to solicit funds from the individuals and firms of the non-ferrous metals trades.

Irving H. Chase has been elected chairman of the board of directors of the Waterbury Clock Co., Waterbury, Conn. He was formerly president and general manager and on his recommendation, **C. W. Curtiss** of Orange, N. J., was elected to succeed him in those positions. Mr. Chase has served the clock company for about 50 years, and has been president for the past twenty. He now feels the transfer of responsibility to a younger man is desirable. Mr. Curtiss was associated for seventeen years with John Alvord of Torrington, Conn., holding positions of responsibility in various enterprises, among them Splitdorf Electric Company. Afterwards Mr. Curtiss was with John Willys at Toledo, Ohio, where he was occupied with the speedometer business. He was born at Southington, Conn., and has had considerable interest in New England for many years.

Obituaries

Col. Edward A. Simmons

Col. Edward Alfred Simmons, publisher of "Railway Age" and a number of other journals, an authority on the engineering of water and rail transportation, died suddenly on October 1, 1931, after suffering a cerebral hemorrhage. He was 56 years old. He was born at Brooklyn, N. Y. He went through public school and then started his business career by working in a store.

Colonel Simmons had been for the past twenty years president of the Simmons-Boardman Publishing Company, New York. He was also chairman and president of the American Saw Works, American Machine Tool Company, and Rogers-Eagle Grinding Machine Company, all at Hackettstown, N. J. He served as chairman of the endowment committee of the Engineering Foundation, Inc., and president of the American Marine Standards Committee. In recent years

he served several times as American representative at international transportation conferences. He received a citation for his work while a major in the Construction Division of the United States Army during the World War.



COL. E. A. SIMMONS

Dr. Samuel W. Stratton

Dr. Samuel W. Stratton, originator and former director of the United States Bureau of Standards, president of the Massachusetts Institute of Technology, etc., died suddenly on October 18, 1931, at his home in Boston, Mass. He was seventy years old.

Dr. Stratton was born at Litchfield Ill., and was educated at the University of Illinois. He became a mechanical engineer, then instructor in the University, where he organized the department of electrical engineering, in which he was made professor. Later he was a professor at the University of Chicago. In 1900 he effected his plan for a national Bureau of Standards, and he was director of it until 1923, when he became president of M. I. T.

John A. Calder

John A. Calder, general factory manager of the Torrington Company, Torrington, Conn., died suddenly on September 18, 1931. Mr. Calder was fifty-eight and had been with the company for twenty-four years.

George F. Dodge

George F. Dodge, president of the New York Nickel Plating and Manufacturing Company since 1888, died October 28, 1931, at his home in New Rochelle, N. Y., of a cerebral hemorrhage. He was 89 years old.

John A. McAvity

John A. McAvity died recently at St. John, New Brunswick. Mr. McAvity had a long business career in the Maritime Provinces. He was vice-president of T. McAvity and Sons, Ltd., established in 1834 as a manufacturer of valves, fittings, and brass and iron products.

John H. Crabel

John H. Crabel, 61 years old, of Fennington, N. J., for many years associated with the J. L. Mott Company, Trenton, N. J., died September 19, 1931, after an illness of three months. For twelve years he was superintendent of the Trenton Fire Clay and Porcelain Company, which is controlled by the Mott company.

C. A. L.

Fred C. J. Wiss

Fred C. J. Wiss, president of J. Wiss and Company, Newark, N. J., cutlery and jewelry manufacturers, died October 9, 1931, after a year's illness. He was seventy-three years old, and had been in charge of the cutlery business founded by his father since he was sixteen. When he first assumed charge it employed three men; it now has about 500 employees and does a world-wide business, especially in shears. Its development was due to the efforts and ability of Mr. Wiss.

Josh W. Mayer

Josh W. Mayer, president and one of the founders of Powers and Mayer, Inc., New York, pioneers in the manufacture of platinum jewelry, died October 4, 1931, in his sixty-eighth year. Besides his important place in the jewelry industry, Mr. Mayer was a remarkably fine amateur magician, practicing magic as a hobby. He was widely known for his many free performances for the benefit of orphanages and other institutions.

Charles A. Fickes

Charles A. Fickes, formerly foundry superintendent for the Detroit Malleable and Brass Works, Wyandotte, Mich., died recently at Canton, Ohio. He was sixty-one years old. Mr. Fickes started his career with the McClain Company, Canton, and remained with that firm for twenty-seven years, for twelve of which he had charge of the foundry. He was night superintendent of the Timken Detroit Axle Company in 1917-18. He was with Detroit Malleable and Brass Works from 1925 to May of this year.

A. A. Grubb

A. A. Grubb, a member of the metallurgical engineering firm of Grubb and Marshall, Columbus, Ohio, died September 29, 1931. Mr. Grubb was an engineer and educator, having taught physics and chemistry at Ashland College for some years. From 1919 to 1928 he was director of laboratories for the Ohio Brass Company, Mansfield, Ohio. He was an expert on molding sand and took an active part in the work of the American Foundrymen's Association.

News of the Industry

Industrial and Financial Events

Small-Quantity Extras on Brass

Revere Copper & Brass, Inc., (Taunton-New Bedford Division), accompanying the new base prices on metal products, issued as of October 1st, published the following list of small-quantity extras to apply when less than 1,000 pounds of any item is ordered.

Applying to single items of less than 1,000 pounds for complete shipment at one time:

Items less than	To and including	Additions for quantity
1,000 lbs.	500 lbs.	¾c. net per lb.
500 lbs.	200 lbs.	½c. net per lb.
200 lbs.	100 lbs.	1c. net per lb.
100 lbs.	50 lbs.	3c. net per lb.
50 lbs.	25 lbs.	6c. net per lb.
25 lbs.	Not less than	12c. net per lb.

To other than contract buyers, items of less than 1,000 pounds of metal, 25 per cent discount from extras for width, gauge, finish, etc., will apply to all scheduled products, except pipe.

Drawn brass, nickel silver and phosphor bronze, moldings, angles, channels; also seamless tubes, except pipe: double the above additions for quantity.

Case or crate charges, holding less than 100 lbs. of:

	Each
Rolls, strip, wire or rods	\$.75
Seamless tubes or moulding	\$1.25
Flat sheets or plates	\$1.50

Base prices previously were predicated on items of 100 lbs. and over.

Under the old list, the extras provided for 2½c per pound on 75 to 100 lbs., 3½c on 50 to 75 lbs., 6c per lb. on 25 to 50 lbs., and 12c per lb. under 25 lbs. These extras did not cover seamless tubes or angles or channels, on which extras varied according to size.

In the case of seamless tubes, over 5 inch in diameter, extras range as high as 25c to 50c per lb.

It is understood that approximately the same list of small-quantity extras is maintained by the American Brass Co., and other manufacturers.

Western Electric Buys Refinery

Edgar S. Bloom, president of the Western Electric Company, announces the acquisition as of November 1 of the Nassau Smelting and Refining Company and the plant and inventory of the Tottenville Copper Company, by purchase from Benjamin Lowenstein who founded the business 49 years ago. The plant is on a 45-acre tract at Tottenville, Staten Island, N. Y., has a floor area of 150,000 sq. ft., and refines about 25,000 tons of non-ferrous metals annually. It employs at present 150 men. Mr. Bloom stated that for many years the Western Electric Company has reclaimed a portion of the scrap metals from its manufacturing operations and from material removed from service in the Bell System. This pur-

chase offers the opportunity for the Western Electric Company to carry on more fully this work of reclamation and makes possible economies through the consolidation of the work with the present refining business of the Nassau Smelting and Refining Company.

Frederick W. Willard, Summit, N. J., assistant works manager of the Western Electric plant at Kearny, N. J., has been appointed executive vice-president in charge of the new refining subsidiary formed from the Nassau and Tottenville purchase.

Brass Plants Reduce Wages

Reductions of 10% in the pay of all hour and piece time workers of the local plant of the Chase Companies, Inc., Waterbury, Conn., effective at once, were announced in all of the plants on October 5, according to press reports. It was stated that the reductions, according to company officials, come after long hesitation on their part to adopt such a measure and only after the adoption of wage cuts by other brass manufacturing concerns in various parts of the country, following upon the wage cuts announced by steel companies.

The adoption of wage cuts by other concerns in the brass industry, officials stated, made it necessary for the local concern to adopt a similar step in order to be able to compete with other brass companies and secure contracts for local plants. A 10% cut of salaried workers was recently made.

The cut affects employees of the Waterbury Manufacturing Company, the Chase Rolling Mill and the Chase Metal Works.

New Plating Merger in Detroit

United Platers, Inc., 994 Madison Avenue, Detroit, Mich., has been organized by Glenn Friedt and associates, to engage in general electroplating on a production basis. The company has purchased and merged the Motor City Plating Company and the Enterprise Plating and Manufacturing Company, and the complete equipment has been installed at the Madison Avenue location. The company specializes in production work for the automotive industries operating automatic polishing, buffing and plating machinery. Mr. Friedt is president; J. C. Nankervis, vice-president; V. B. Arnold, secretary; H. E. Adelsperger, treasurer.

Thomas Paulson and Son, Inc.

A false report has been circulated throughout the metropolitan district that Thomas Paulson and Son, Inc., Engineers and Founders, Brooklyn, New York, is no longer engaged in active business. This report is entirely without foundation. The company has been established since 1883 and has been in its new plant for over a year making castings of aluminum, brass, composition, copper, phosphor, government manganese and hydraulic bronzes. Their plant is laid out and equipped in an up-to-date manner to produce work of the best character.

F. A. Wales Heads Aluminum Colors, Inc.

Fred A. Wales has been elected president of Aluminum Colors, Inc., Indianapolis, Ind. Mr. Wales became associated with this company shortly after it was organized in 1929, and in the capacity of vice-president was actively engaged in the development of the "Alumilite" process for treating and coloring aluminum and its alloys.

Ralph E. Pettit has been appointed sales engineer and will be identified with "Alumilite" promotion and sales service. Prior to this connection, Mr. Pettit was in the research department of Aluminum Company of America. In his new position he will work on the development of the commercial applications of nickel, chromium and oxidized electroplated finishes on aluminum.

At present, Aluminum Colors, Inc., is sole licensor for the "Alumilite" process, as well as for the deplating process used in architectural applications for aluminum. Aluminum Colors, Inc., recently moved from 401 Michigan Street to 537 East Washington Street, Indianapolis.

World Platinum Accord

A world platinum accord was announced in London on October 21 as a result of the formation of a new English company, Consolidated Platinums, Ltd., which has concluded contracts to buy and resell virtually all the new platinum production originating in the U. S. S. R., Canada, South Africa and Colombia, constituting a major portion of the world output. The announcement of Consolidated Platinums, Ltd., states that one of its major functions will be to promote the use of platinum through intensive research and market development. It will be managed by a committee of representatives of the following companies, which are involved in the contracts mentioned: Edelmetall-Vertriebs, A.G.; Mond Nickel Co.; New Consolidated Goldfields; Compania Minera Choco Pacifico. P. L. Ginsburg and E. B. Howard White will act as joint managers. Existing dealers and distributors will be unaffected as present distribution methods are not to be changed.

World Aluminum Syndicate Formed

An aluminum marketing company has been formed by the producers of Canada, Germany, France, England and Switzerland, according to press reports received from Switzerland last month. Norwegian producers were also taking an interest, it was stated. This accord is similar, it was stated, to that reached by the chief platinum producers. Development of a broader market for the metal is contemplated, and a \$7,000,000 Swiss corporation has been set up. It is expected that the new organization will quote prices in Swiss francs.

Foundry Lumber in Demand

Considerable demand for pattern and flask lumber for eastern foundries is indicated by a press report last month of the movement eastward of a 91-car special freight train carrying sugar pine lumber from Pinedale, Cal. The report quotes E. C. Schmidt of the Union Pacific system, who said that the "mile-long train consigned to manufacturing plants . . . seems to . . . indicate a significant pick-up in . . . lines whose product . . . probably would not be made unless there was a demand therefor."

Doehler Die Casting Company

Doehler Die Casting Company, New York, and the Bohn Aluminum and Brass Corporation, Detroit, Mich., have announced an arrangement by which the Doehler Die Casting Company takes over the Bohn die casting division in exchange for the former's permanent mold department. Closer co-operation between the two companies is indicated by this transaction.

Pittsburgh Copper & Brass

A substantial interest has been acquired in C. G. Hussey & Co., Pittsburgh, Pa., operators of the Pittsburgh Copper & Brass Rolling Mills, by the Copper Range Co., which has been supplying the entire copper requirements of the Hussey company for more than five years.

Metal Developments

COPPER for building walls and other vertical surfaces is advocated by R. L. Agassiz, president of Copper and Brass Research Association, writing in the "Mining Congress Journal."

COPPER license plates will be used in New Jersey in 1932.

COPPER coins are being shipped out of China as scrap metal, due to the decline in its monetary value to almost nothing. Japan is purchasing most of the coins scrapped.

NOVELTY JEWELRY of aluminum is growing active, according to business reports. Lightness and good appearance when finished are stressed as advantages. Chromium plate has been applied to some of it. Bracelets are in demand, especially in sets. Other metals are also in vogue, in bright and antique finishes.

ALUMINUM ALLOYS are used for more than 80 per cent of all aircraft propellers approved by the Department of Commerce.

ALUMINUM was used for eight Gould pumps on the dirigible Akron. They weigh 16 lbs. each, as against 110 lbs. if made of iron.

A METAL TOP for convertible automobiles has been placed on the market by B. B. Ellerbeck, Salt Lake City, Utah. It is made of sheet aluminum or steel.

LEAD, BISMUTH, MERCURY and other heavy metals were found to become radioactive upon exposure to X-rays, according to reports of research by Russian scientists. Light metals were unaffected.

ALUMINUM BUSES shown by General Motors Truck Co., at an exhibition in New York last month were lighter than similar steel vehicles by the equivalent of 26 passengers, over 6,600 lbs. being saved.

ALL-ALUMINUM WALLS will be tried out in a new building at Richmond, Va. Eighth-inch sheet aluminum alloy will be used instead of usual masonry, with rock wool filling between outer wall and inner lining of building.

Business Show

The 28th annual Business Show was held in New York the week of October 19. There was the usual array of exhibits showing every conceivable device for the aid of carrying on business. This included all kinds of business machinery for writing, bookkeeping, mailing, advertising, displaying and many other activities pursued in connection with the conduct of all types of business and many industries. Naturally, metals were predominant as material for the construction of the multifarious products on display, and there was indication that the steadily growing tendency to use metals wherever possible is unabated. Finishes on the numerous metals and alloys were also of interest. Every type of electroplate, with a goodly amount of chromium very apparent, were shown; lacquers, enamels, and various chemical colorings such as oxidizes and antiques were also shown in abundance.

Sale of Condemned Scrap Metals

Approximately 136,000 pounds of condemned nonferrous scrap metals will be sold by the Supply Office, Building No. 3, Navy Yard, Brooklyn, N. Y., in a sale on which purchase bids will be opened at 10 a. m., November 12, 1931. Complete information, terms of sale, etc., are given in the catalog N. Y. No. B-5-32, obtainable from the office mentioned.

Business Troubles

Syracuse Plating Works, Syracuse, N. Y., has filed voluntary petition in bankruptcy and Mrs. F. Braungard and Nicolò Damico, partners in the firm, have petitioned for an accounting from W. A. Schuler, the third partner, who has also filed a petition in bankruptcy.

American Metal Spinning & Welding Co., 682 South Eleventh St., Newark, N. J., was ordered last month to show cause why a receiver should not be appointed. Edward King, treasurer of the concern, charges that the company, incorporated August 28 last, now is insolvent and that there is dissension among its officers.

Brass Ingot Business

Non-Ferrous Ingot Metal Institute, Chicago, Ill., reports average prices per pound received by its membership on commercial grades of ingot brass during the twenty-eight day period ending October 9th, as follows:

Commercial 80-10-10 (1 per cent impurities), 8.341c; Commercial 78 per cent, 6.717c; Commercial 81 per cent, 6.888c; Commercial 83 per cent, 7.200c; Commercial 85-5-5-5, 7.403c; Commercial No. 1 yellow brass, 5.938c.

On October 1st, unfilled orders for brass and bronze ingots and billets on the books of the members amounted to 20,073 net tons.

The combined deliveries of brass and bronze ingots and billets by the members in September amounted to 3,109 tons.

Corporation Reports

Bohn Aluminum & Brass Corp. reports for nine months ended September 30th net profit of \$913,060 after charges, depreciation and Federal taxes equal to \$2.59 a share on 352,418 shares against \$692,736 or \$1.95 a share in the first nine months of 1930.

Morrison Brass Corporation, Ltd., Canada, omitted dividend due last month on 7 per cent preferred stock.

Revere Copper & Brass, Inc., has declared regular quarterly dividend of \$1.75 on the preferred stock, payable November 2nd to stock of record October 10th.

United Engineering & Foundry Co. last month issued a statement declaring that it has demonstrated earning power over a period of 30 years, and at the present time has in cash, marketable securities, including government bonds, and accounts receivable, all of which are considered good, an amount equal to a value of \$16.50 per share of common stock, exclusive of inventory and after deducting current liabilities and also after providing for the preferred stock equity.

International Silver Company and subsidiary for the September quarter show net loss of \$148,578 after depreciation, com-

paring with net loss of \$120,595 in the preceding quarter and net loss of \$311,063 in the third quarter of 1930.

General Cable Corporation—Three months ended September 30: Net loss after interest, depreciation and other charges \$1,233,272, compared with net loss of \$575,643 in the preceding quarter and net loss of \$315,856 in third quarter last year.

New Companies

Excel Brass & Aluminum Foundry, 14th St. and Broadway, Pekin, Ill., has been organized by **C. E. Robinson** and **A. Huffard**. Mr. Robinson, who will manage the foundry, has had 25 years' experience in nonferrous metal lines. The firm will cast brass, bronze and aluminum, and operate a grinding department.

Aluminum Bronze Castings has been organized at Buffalo, N. Y., to establish and operate a plant for the manufacture and distribution of aluminum and bronze castings. **Joseph L. Babinger, Jr.**, 191 Herkimer Street, is general manager.

American Metal Company

The American Metal Co. omitted the regular quarterly dividend of \$1.50 on the 6% preferred stock due at this time. In the September quarter, the company reported a net loss of \$250,537 against a net loss of \$211,344 in preceding quarter and net profit of \$357,327.

Conference on Metals and Alloys

A conference on metals and alloys will take place November 18, 19 and 20, under the auspices of the Case School of Applied Science and the Cleveland Engineering Society, Cleveland, Ohio. There will be a large program of papers on nonferrous metals and alloys.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

NOVEMBER 1, 1931.

Rumors that the **Waterbury Clock Co.** might merge with or acquire the **W. L. Gilbert Clock Co.**, Winsted, and the **Sessions Clock Co.** and **Ingraham Clock Co.**, Bristol, were denied last month by officials of the local concern. It is understood that officials of the Winsted and Bristol companies also declared there had not even been any negotiations to this effect. The rumor followed the recent election of **C. W. Curtiss**, Orange, N. J., as president of the **Waterbury Clock Co.** He succeeds **Irving H. Chase**, who becomes chairman of the board of directors.

James R. Sheldon of New York was elected vice-president of the **Beardsley & Wolcott Co.**, at a meeting of the directors last month. The office has been vacant since February. **Philip Cain** of New York was elected assistant treasurer, a new office. Mr. Sheldon was also elected a director for a company. **Mason T. Adams**, who served as president for a short time early in the year, resigned as a director. **George T. Wigmore** of Naugatuck, one of the founders of the company, also resigned as a director. **Fletcher W. Judson**, president of the **Waterbury National Bank** was elected a director. **R. W. Reid** remains as president, **R. W. Phillips** as secretary, and **F. T. Phillips** as treasurer. The proposed merger of the company with the **Connecticut Electric Mfg. Co.**, Bridgeport, although approved by the stockholders, has not yet been put into effect as it has to receive the approval of the federal court.

Many local citizens who formerly held large blocks of **American Brass Co.** stock which was exchanged for **Anaconda**

Copper stock are hard hit by the passing of the latter's dividend last month. From May, 1929, to May, 1930, dividends at the rate of \$1.75 were paid each quarter. Recently, the dividend was 37½ cents a quarter.

Among patents granted local inventors during the last month are the following: **Morris Bennett**, assignor to the **Scovill Mfg. Co.**, fuse; **Carlton W. Bristol**, assignor to the **Bristol Co.**, adjustable anchoring fitting for thermometer bulbs; **Benjamin S. Coe**, assignor to **Steele & Johnson Mfg. Co.**, combination ash receiver and match holder; **Edward S. Cornell**, assignor to the **Chase Companies**, tube-flanging tool; **William K. Simpson**, assignor to the **Hoffman Specialty Co.**, thermostatic steam trap; **Fred L. V. Spring**, assignor to the **Chase Companies**, pump-type oiler; **William H. Burt**, assignor to the **Chase Companies**, tube-flanging tool; **Leonard R. Carley**, assignor to the **Patent Button Co.**, buttons; **Arthur D. Patchen**, assignor to the **Scovill Mfg. Co.**, pronged plate device for attaching seat covers.

The plan which **Waterbury** has followed for the past year for relieving unemployment, weekly contributions from all who are employed, which are used to provide work on public projects, has been praised by **President Hoover** in a letter received by the local committee, and has been recommended to his national committee on unemployment as a model to be followed throughout the country.

Noera Mfg. Co., a subsidiary of the **Chase Companies**, has operated for one year and 47 days without a loss-of-time accident. In recognition of that fact, the officials of the **Chase Companies** gave a banquet last month to the safety committee of the **Noera** concern. Much of the credit for the record is given to **Charles E. Webber**, manager of the plant.

The plant manufactures oil cans, grease guns, automobile and bicycle pumps and metal stamping novelties such as ash trays and smoking stands, necessitating the use of foot and power presses and stamping machinery. To insure safety, the work is constantly covered by patrolling supervision consisting of a safety engineer and his aides, and the safety committee. The committee meets once a month to devise new safety plans and to educate new employees along safety lines.

W. R. B.

Connecticut Notes

NOVEMBER 1, 1931.

NEW BRITAIN—American Hardware Corp., after payment of the October dividend, had cash and United States government securities in excess of \$6,100,000, or the equivalent of \$12.30 a share, a statement by the company shows.

Landers, Frary & Clark's report last month shows \$6,700,000 in cash and government securities, or the equivalent of \$15.95 a share, and in addition \$1,400,000 in investments, making a total of \$19.28 a share. This is in addition to the company's buildings and plant, valued at \$4,900,000.

New Britain-Gridley Machine Co. has started work on a new machine for the **New Departure Co.**, Bristol, for which many units will be required during the coming winter and spring. It is understood the new machines will be used for the manufacture of units in a free wheeling device for cars.

Union Mfg. Co. paid a dividend of 12½ cents a share on its common stock Oct. 1.

BRISTOL—Preferred stockholders of the **Bristol Brass Corp.** have received a letter relative to the calling in of one-half of the outstanding preferred stock, which states that the corporation on July 31 had a surplus of \$725,000, after adjusting inventories to the current price for copper and spelter, and no debts except small current accounts payable. Cash on hand was \$655,872. This is a great change from Dec. 31, 1923, when the corporation owed banks, accounts payable, etc., nearly \$450,000, and had a surplus of only \$291,644.

E. Ingraham Co. is speeding up production due to receipt of orders for Christmas business. It has put out a new line of \$5 wrist watches and a new electric clock. Employees laid off during the summer are being recalled.

HARTFORD—Local Manufacturers, including Pratt & Whitney, Underwood-Elliott-Fisher Co., Royal Typewriter Co., Colt's Fire Arms Co., Hartford Machine Screw Co., Taylor & Fenn and Case, and Lockwood & Brainard, have appealed to the mayor to put into effect drastic reductions in the city budget for next year so that the tax rate may be lowered. Otherwise the local industries will suffer.

Pratt & Whitney Co. has purchased the entire factory of the **Keller Mechanical Engineering Corp.**, Brooklyn, N. Y. It is the intention of the local concern to move the machinery, equipment tools, fixtures, patterns and inventory of the Brooklyn plant to some of the rooms formerly occupied by the Pratt & Whitney Aircraft Co.

MERIDEN—The **International Silver Co.** has started work on an order for 56,000 pieces of silverware for two liners of the United States Lines now under construction at Camden. The equipment differs from that usually seen, including combination soup stands, cocktail and supreme fruit juice service, escoffier and special cabin combination dishes, chafing dishes and large size individual coffee pots.

WINSTED—The **Strand & Sweet Mfg. Co.**, owned by the **Polymet Mfg. Co.**, was first ordered closed by the parent company and then ordered to continue operation through the winter on a skeleton force last month. The skeleton force consists of but seven men, whereas a year ago over 100 were employed. **Robert L. Noble**, superintendent of the local plant, is expected to go to the Easton, Pa., branch.

SOUTHINGTON—**Peck, Stow & Wilcox Co.** announces that the tool division of the Cleveland plant will be moved to the local factory. The local plant employs about 400 and the Cleveland plant about 125. The Cleveland plant manufactures builders' hardware, pruning shears, hammers and agricultural wrenches.

NEW HAVEN—Reports current two months ago that the du Pont interests would finance the acquisition of the **Winchester Arms Co.** of this city by the **Remington Arms Co.**, Bridgeport, were apparently unfounded, because negotiations

are now in progress for the acquisition of the local concern by the **Western Cartridge Co.**, East Alton, Ill. A meeting of the committee representing the first mortgage and debenture holders of the local company was held in New York last month which drafted a decree providing for this acquisition to be submitted to the United States court for approval. The **Union & New Haven Trust Co.**, and **W. A. Tobler** are receivers for the local company. According to reports the sale price is in the neighborhood of \$7,000,000, a certain proportion to be paid in stock of the Western Cartridge Co. The latter is said to be a closely held corporation, controlled by the Olin interests. It is understood that after the sale has been made that the local plant will continue operations as before.

MIDDLETOWN—The stockholders of the **Middletown Silver Co.** have voted to increase the capital stock from \$90,000 to \$136,000. The capital consists of 3,600 shares of par value of \$10 each and 4,000 shares of par value of \$25.

ANSONIA—**Farrel-Birmingham Co.** has entered into a contract with the **D-N Incinerator Co.**, Winston-Salem, N. C., to manufacture all the machinery and forgings for the latter company's products.

TERRYVILLE—The **Eagle Lock Company's** statement, issued last month, shows investments amounting to \$2,500,000 or equivalent to \$31.25 a share, although the stock is selling in the market now at \$24. The company's plant and equipment is carried in its statement at but \$100,000 although the town assesses it for \$2,500,000.

W. R. B.

Providence, Rhode Island

NOVEMBER 1, 1931.

Fifty-six individuals, firms and corporations affiliated with the metal trade of Providence are in the list of taxpayers assessed this year on a property valuation of \$50,000 or more, according to the returns of the Board of Tax Assessors. The total valuation of these interests is \$27,003,680.

Reduction to a minimum of "an enormous economic waste" created by individual firms who seek to cater to popular taste, not always accomplished on an authoritative basis," was the outstanding specific recommendation made at the banquet of the **New England Manufacturing Jewelers' and Silversmiths' Association**, held at the Turks Head Club on the evening of October 22, following the annual corporation business meeting and election of officers. This waste has filled distribution channels with a wide variety of patterns, designs and colors, some accepted and other rejected by distributors, resulting in duplication of efforts and confusion, it was reported by the special survey committee that has been making a study of conditions. As a remedy it was suggested that the manufacturing jewelry trade make a study tending toward standardization of styles, uniformity in cost calculation, and uniform distribution at lowest possible expense. The committee further advised establishment of an agency for continuous study of styles and consumer demands.

New corporations have been organized as follows during the past month: **Abel Jewelry Co., Inc.**, manufacturing jewelers, Providence; 200 shares common, no par; by **Bernard Abel, A. L. Abel** and **Arthur J. Levy** all of Providence. **Crouch-Bolas Manufacturing Co., Inc.**, air-craft; Pawtucket; 4,000 shares, no par, by **R. J. G. Crouch**, 38 South Angell Street, Providence; **Harold Bolas** and **Lawrence J. McCarthy**.

Aram Nalbaudian, 131 Alabama Avenue, has filed a statement that he is sole owner of the **Modern Enameling Company**, 220 Eddy Street.

R. J. Company, Providence, has been granted a Rhode Island charter to manufacture jewelry; capital, 100 shares common, no par; by **Leonard Mark, M. McCormick** and **Jack Schwartz**.

Richie & Paul, Inc., Providence, electroplaters, have been incorporated with capital of 100 shares common stock, no par; by **Joseph Paul, Hugo Medici**, and **Anthony Matera**.

Alleging infringement of its patent rights on a "new and original design for a collar holder," **Baer & Wilde Company**, Attleboro, Mass., has filed a bill of complaint in the United States District Court in Providence against **Archibald Silverman** and **Charles Silverman**, doing a manufacturing jewelry

business at 266 Public Street, Providence, under the firm style of **Silverman Bros.** The complainants ask for a perpetual injunction restraining the defendants from any further alleged infringement of their patent rights and for an accounting of all profits that might have been obtained by the defendants as a result of the infringements alleged by the plaintiffs.

W. H. M.

Massachusetts Notes

NOVEMBER 1, 1931.

A slight increase in employment is recorded by the labor barometer figures for 26 metal working concerns collected recently in Western Massachusetts. A total of 213 more workers were employed by those organizations on Oct. 1 than on the first day of the preceding month, and indications point to the fact that when the next report is compiled even a larger increase will be noted. Total employment for the 26 concerns on Sept. 1 was 13,173 against 13,386 on Oct. 1. For the most part increases were reflected by those factories producing special machinery, machinery equipment, electrical equipment, machine tools and automobile accessories.

Central Specialty Company, recently formed at Westfield, Mass., which includes work in tool salvage by metal spraying, is the only organization of its type in the New England area. This firm has been negotiating with the Bigelow-Sanford Rug Company and it is expected that the carpet firm's dye house will be sprayed with lead as a protection against acid in the near future.

A new type of mesh wire for use in fourdrinier machines in

paper mills has just been designed at the **Cheney-Bigelow Wire Company**, Springfield. The new process calls for the use of both bronze and stainless steel wire, and the mesh for the machinery is found to be much more efficient than the brass or bronze wire used alone as formerly. **G. M. Peterson**, president of the company, in whose name the patent was issued, states that increased tensile strength resulting from the combination of the two wires will increase the life of the mesh from 50 to 100 per cent.

For some time the metal trades in Springfield, Mass., have felt that the name given their city "the city of homes," has been a decided hindrance in marketing the products manufactured in the city, and as a solution of this difficulty have decided to open a drive with the express purpose of letting "the world" know that in addition to being the city of homes, Springfield is also the home of many prominent metal industries. The first move made in this new program for expansion is the development of a four-page calling card which will be used by representatives of companies wishing to assist in the plan to make the city's products better known. The card lists many of the Springfield products.

A committee chosen to accelerate the work of arousing the interest of the other firms in the city in presenting their representatives with cards is composed of **Edward J. Fleming, Jr.**, of the **Fleming Foundry Company**; **Austin C. Ross**, of **Rolls-Royce of America, Inc.**; **Irving Scheen**, of the **Hampden Brass Company**; **Otto C. Kuhrt**, of the **Chandler Company**; **Howard L. Washburn**, of the **Metal Saw and Machine Company, Inc.**; **Lawrence P. Marshall**, of the **Standard Electric Time Company**, and **S. F. Cushman**, of the **Central Specialty Corporation**, Westfield.

G. B. Y.

Middle Atlantic States

Central New York

NOVEMBER 1, 1931.

Slight improvement in employment in the Rome, N. Y., area was noted in the reports of the Industrial Association of Utica for the first half of October. Employment figures climbed about 2 per cent over a similar period in September. The association tabulates figures on the employment activities of the **Rome Manufacturing Company**, the **Revere Copper & Brass, Inc.**, and the **General Cable Corporation**.

Ray Noyes of the **Oneida Community, Limited**, Sherrill, N. Y., authorized a statement Oct. 19 that the company has been experiencing a "very gratifying increase in orders for the last few weeks."

Shipments of the **Hart & Crouse Company**, Utica, for 1931 have increased 30 per cent over 1930. This statement was made by **James J. Lally**, president and general manager, who said that during 1931 the plant had been in operation six days a week with 30 per cent increase in employment over last year. Mr. Lally anticipates this record for employment will continue throughout the year. The company has on its books ready for shipment considerable unfilled tonnage according to Mr. Lally who said the tonnage increase in 1931 over 1930 is between 40 and 50 per cent.

Utica Steam Engine & Boiler Works, Utica, has installed the latest outfits of both portable and stationary machines for electric welding, and is ready to take care of all classes of work either at its own plant or wherever the need may arise.

Work has been started on the erection of a new warehouse building for **Sam Ciocca & Company**, 646 Bleecker Street, Utica, which will provide for the company's growing business. Increase in the glazing business of the company and need for room to store bronze, copper and aluminum store fronts created the necessity for the warehouse.

A slight increase was shown in the report for September in the number employed in Utica in the metal trades, while the number of hours worked in the Utica area increased about 1 per cent.

Electric clocks, radio parts, and switch plates are being manufactured by the **American Emblem Company**, New Hartford, which reports marked improvement in business. The

concern, which until recently was working only one-third of its force, anticipates that by November one-half or more of the employees will return, according to **Earle Congelton**. **George B. Ogden**, president, is establishing a stronger sales policy and broadening the scope of the business. A new electrical clock which has a chrome plated case is increasing business. Manufacture of escutcheon plates for **R. C. A.**, **Fada**, and **Majestic** radios has helped to keep the force busy. The recent spurt in radio sales has helped orders. A slight increase in the manufacture of copper switch plates used by the building trades is reported. The company recently completed an order of 80,000 souvenirs given away by an automobile concern at the Legion convention in Detroit. The badges and emblems are made from different alloy metals.

E. K. B.

Newark, New Jersey

NOVEMBER 1, 1931.

Breeze Corporation, Inc., 24 South Sixth Street, has been restrained by Vice-Chancellor **Berry** from manufacturing any devices infringing on an invention by **Noel Pemberton Billings** for radio remote control. The company was also directed to return to Billings models he had furnished when he entered into a licensing contract with the concern to manufacture his device. Billings was restrained from removing the models from the United States pending final hearing in the suit for accounting brought by him. He is a British subject and a former member of Parliament.

Manufacture of radio accessories and electrical appliances on a large scale will be undertaken by the **Gold Seal Electrical Company, Inc.** Combining their plants in Newark and at Poughkeepsie, the Gold Seal Company will occupy about 50,000 feet of space at the Newark plant. The office of the company now at New York City will be moved to Newark. **W. E. Duff** is president.

Five trustees in dissolution have been appointed for the **Hyvac Radio Tube Corporation**, Newark, subject to approval of stockholders and creditors. Application for the appointment was made by the **Volkmer Radio Products Corporation**, a stockholder and creditor.

Vice-Chancellor Berry has directed **Emanuel P. S. Scheck**, receiver for the **Charles H. Ingersoll Dollar Pen Company**, to surrender all assets of the defendant concern as soon as claims of general creditors and administration costs have been paid by its officers. Scheck was made statutory receiver for the company early in September. The company has a plant in East Orange. General creditors have agreed to defer payment until the company can reorganize and earn a profit.

Concerns chartered in Trenton during the month were: **Royal Saxon Co., Inc.**; chemicals; \$5,000; Bound Brook. **Kaufmann & Co.**; brass and nickel; \$100,000; Rutherford. **Vapon, Inc.**; manufacture chemicals; 1,000 shares preferred and 1,000 shares common; Montclair. **General Welding Shop, Inc.**; welding; \$125,000; Elizabeth. **Consolidated Products Corporation**; polishing appliances; \$50,000; Plainfield.

C. A. L.

Trenton, New Jersey

NOVEMBER 1, 1931.

Federated Metals Corporation, Trenton, has asked the Interstate Commerce Commission to reduce freight rates on zinc ashes and skimmings from points in Canada to Trenton over

the Pennsylvania Railroad. The corporation maintains in its complaint that the rates are excessive in that they exceed 85 per cent of the sixth class rate on spelter between the same points. Shipments have been made over a period of two years between Toronto, Hamilton, Welland, all in Canada, and Trenton.

Some of the metal manufacturing plants have announced a reduction in wages amounting to 10 per cent because of the depression in business.

The big plant of the **Jordan L. Mott Company**, which has twice been in the hands of receivers, is now closed down indefinitely and it is not known if it will be operated again. A few years ago the company was one of the most prosperous of its kind in this section and employed many people. After it was taken over by a Southern concern business began to pick up. Lately orders began to decline and receivers were again appointed.

Following concerns have been incorporated here: **Alexander Chemical Co., Inc.**; \$125,000; Fairlawn, N. J. **Commercial Products, Inc.**; chemicals; \$25,000; Hasbrouck Heights. **Curtis Ignition Co., Inc.**; 2,500 shares; manufacture ignition apparatus; Camden. **Mechanical Products Corp.**; mechanical devices; \$400,000 preferred; Camden. **Kaufmann & Co.**; \$100,000; metals; Rutherford.

C. A. L.

Middle Western States

Detroit, Michigan

NOVEMBER 1, 1931.

Practically all the non-ferrous metal plants in this area are laboring under the stress of depressed economic conditions. Some are not quite as adversely situated as others, but all are having plenty to do to keep from going too deeply into the "red."

The plating industry has just as much to contend with. Until after the first of the year, manufacturing in this area will not do much more than mark time, it seems. The motor car industry, one of the greatest consumers of non-ferrous metal products, already has slumped into its early winter quiet, and no doubt will continue to hibernate until spring production starts.

Unemployment is so distressing just now that it is advised that non-ferrous metal workers and platers keep away from Detroit until well along into the new year. Even then their chances will not be promising, because Detroit workers will be given preference over any that may come from outside. From an employment standpoint Detroit is facing a drab winter. Even at the present time the Welfare Department is overtaxed with demands for assistance.

Platers, Inc., 3456 Denton Avenue, has recently been incorporated with a capital stock of \$15,000. This concern is engaged in a general plating and polishing business. The incorporators are **H. E. Adelsperger, Jr.**, **J. C. Nankervis** and **Vincent B. Arnold**.

United Platers, Inc., 994 Madison Avenue, also is a new Michigan corporation. Its capital is \$15,000; owners are: **Glenn Friedt**, **James C. Nankervis** and **H. E. Adelsperger, Jr.**

Auto. City Plating Co., Detroit, has recently changed its capital stock from \$15,000 to \$3,000.

R. W. Peden, of the **Mueller Brass Co.**, Port Huron, Mich., in an address before the Detroit Chapter of Cost Accountants, deplored the lack of standardization in American industrial accounting. In conclusion, he made a plea for a standardized terminology; a standard for the measurement of labor; an index for commodity valuation; more uniformity and agreement in the treatment of such controversial subjects as depreciation, interest as a cost and manufacturing burden. Above all, is needed an enlargement of the scope of operations until it embraces the control of business, whether it be by statistics, engineering data, or the old-fashioned figures that are still "crying to be recognized," he concluded.

Plans for reorganization of the **Detroit Aircraft Corp.** are under consideration, it is stated. It is understood that stockholders will be asked to dissolve five of the corporation's subsidiaries and approve organization of two independent companies to take over the business and assets of the parent corporation.

C. S. Davis, president of the **Borg-Warner Corp.**, announces the acquisition of the physical properties of the **Alaska Refrigerator Co.**, Muskegon, by the Norge Corporation, electric refrigerator manufacturing division of the Borg-Warner organization. Tentative plans, it is stated, include stepping up production at the Alaska plant to approximately three times its present capacity.

National Association of Ornamental Iron and Bronze Manufacturers held its 24th annual convention in Detroit from Oct. 13 to 16. More than 200 delegates were present. One of the features was an address by **Julian Blum** on the new uses of ornamental bronze, iron and wire. The annual banquet was on Thursday evening.

F. J. H.

Wisconsin Notes

Fire of unknown origin caused a loss of about \$10,000 to the plant of the **Star Cast Aluminum Co.**, Milwaukee, on October 17. Ten fire companies were engaged in fighting the fire, which required several hours to extinguish. The building is a long one- and two-story concrete block structure.

Introduction of a new grade of metal, which is widely used in place of hardened steel in making dies, was announced recently by **Ampco Metal, Inc.**, formerly **American Metal Products Co.**, Milwaukee. Shipments of the metal, which is a composition of steel, copper and aluminum, have been made to Philadelphia, Chicago, Cleveland, Detroit, and other fabricating centers. Organized in 1914 with capital of \$25,000, the concern has shown a rapid expansion and is now a \$500,000 corporation occupying about 32,000 square feet of floor space. Officers of the firm are **C. J. Zaiser**, president; **Reinhold Kunz**, secretary-treasurer; and **R. W. Uecker**.

George Vits, president of the **Aluminum Goods Co.**, Manitowoc, presented **John Czekala, Sr.**, a veteran employee of Plant No. 2, with a gold watch, for 25 years' continuous service in the Manitowoc plant, and also a 25-year pin. These awards are now made as the employees reach the 25-year span. At present there are about 28 employees at the company plant who have received this recognition.

W. C. Swift of the **American Brass Co.** was a speaker at

the second welding conference arranged by the engineering departments of the Wisconsin College of Engineering and the University Extension Division, at Madison, October 8, 9 and 10.

Clarence J. Laurent, foreman of the chromium plating department of the Aluminum Goods Manufacturing Co., Two Rivers, was married October 13 to Miss Irene Mach. The couple spent their honeymoon in Chicago. A. P. N.

Other Countries

Birmingham, England

OCTOBER 23, 1931.

The whole outlook of the nonferrous metal market was changed last month by the withdrawal of Britain from the gold standard. Standard copper increased considerably in price and buying was resumed in branches of the metal-using trades which for months past had been stagnant. The spurt seems now to have subsided, although there is a strong undercurrent in raw metal values which suggests that higher prices may be looked for in the future. At present business is somewhat hesitating owing to the interference of the General Election activities. Demand for rolled copper and brass has fallen off again. Basis prices were raised, with the obvious idea of checking speculative buying and this had the desired effect. Moderate specifications have been received for extruded bars and copper tubes.

In the brass foundries and among the metal-using trades generally there is no disposition to buy metal on any extensive scale, although confidence has been partially restored. Some brass founders have experienced a considerable influx of business since the change in the sterling position. Now that sterling has im-

proved some manufacturers complain that they have experienced a falling off in business.

One reason for the slackness of demand for nonferrous metals is the quietness of the automobile industry. It is the end of the season, and the majority of the factories in this district are not busy. Light nonferrous alloys are playing an increasingly important part in the manufacture of motor cars, and the flow of trade in that industry is very soon reflected in the Birmingham metal rolling and casting works.

The radio industry continues to make big calls upon the nonferrous metal rollers. The dark nights have focussed attention upon the necessity for overhauling and buying new sets where necessary. It was stated only a short while ago that there is no unemployment in the radio industry of Great Britain, and the success of the recent Radio Exhibition at Olympia has been reflected in increased orders for sets and component parts.

The monthly return of overseas trade shows a decrease in the value of nonferrous metals exported, as compared with the same month (September) last year. There is one exception, crude aluminum. Here the value exported was £21,515 as compared with £8,031 in the same month last year.

J. A. H.

Business Items — Verified

Aluminum Novelty Manufacturing Company, Inc., 88-94 East Northampton Street, Wilkes-Barre, Pa., is now in production, manufacturing three types of seamless aluminum lunch kits.

Ferrell Brass Foundry, 1646 Tarleton St., Los Angeles, Calif., is building an addition 40 x 90 ft., to its nonferrous foundry which will extend through Compton Ave., when completed.

L. G. Balfour Company, County Street, Attleboro, Mass., manufacturer of jewelry specialties, plated metal goods, etc., states that contrary to recent published reports, it has no plans for plant expansion.

Hilo Varnish Corp., formerly at Marcy and Flushing Avenues, Brooklyn, N. Y., has removed to 42-60 Stewart Avenue, Brooklyn, N. Y. The company is a manufacturer of varnishes, lacquers and allied products.

Westfield Plating & Polishing Co., Westfield, Mass., has reorganized as New England Etching & Plating Co., as a result of expansion of the business. Company operates plating, polishing and lacquering departments.

Loocher-Schefrin Co., 1120 South Barclay St., Milwaukee, Wis., operator of a nonferrous foundry, suffered considerable loss by fire in its smelting furnace department recently. Company plans to rebuild immediately.

Oneida Community, Ltd., Oneida, N. Y., manufacturer of silverware, is advancing operations and has placed flatware plant at Sherrill, N. Y., on full time schedule with branch flatware plant at Niagara Falls, Ont., on a similar basis.

Northern Aluminium Company of England, after having just completed a large factory at Banbury, Oxfordshire, England, is closing down until after the end of the year. Overstock of sheet aluminum and the general British trade depression is given as the cause.

General Abrasive Co. has resumed complete operations after the regular two-week vacation shut-down. Furnace plants at both Niagara Falls, New York, and Stamford, Canada, as well

as the three crushing and grading plants at Niagara Falls started up with their full complement of men.

International Enamelware Corp. is the new name of the International Stamping and Enameling Corp., 360 Furman St., Brooklyn, N. Y., manufacturers of hospital ware and sick room specialties. The change is for sake of simplicity and does not affect the company in any other respect, according to S. L. Weiss, general manager.

Pittsburgh Equitable Meter Company, of 400 North Lexington Avenue, Pittsburgh, Pennsylvania, is contemplating the purchase of a large amount of brass working machinery for the production of water meters. They expect to buy a quantity of automatic chucking and screw machines for quantity production of small brass parts.

Automotive Hardware, Inc., Indianapolis, Ind., has leased increased space. Improved business conditions have made expansion imperative, according to F. E. Little, president. The company has leased for ten years, 10,000 sq. ft. of space in the Industrial Building, 34-38 South Cruse Street. Prices on screws, bolts and nuts are desired.

Neenah Brass Works, Neenah, Wis., which has acquired equipment and business of **Johnson & Wells Machine Co.**, is consolidating operations at its Edna Avenue plant. Otto Johnson and Fred Wells, partners in the machine firm for twenty years, have joined the Neenah Brass Works staff. Company operates a nonferrous foundry and machine shop.

The Mercready-Phelps Company, advertising agency, formerly located in the Graybar Building, 420 Lexington Avenue, New York, has moved its offices to the Babcock Building, 240 West Front Street, Plainfield, N. J. From now on, this agency will specialize in handling direct mail and industrial advertising for New Jersey, Eastern Pennsylvania, and Southern New York concerns. **Herbert V. Mercready** is president and treasurer; **Margaret M. Mercready** is vice-president and secretary of the reorganized agency.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Company of New York, Inc.

NOVEMBER 1, 1931.

The conference of the world copper interests is undoubtedly of greatest interest to the trade at the present time. On the results of this conference between American, Canadian, Belgian, British (Rhodesian) and other producers, who at the same time represent the fabricators, hinges the immediate future price of copper and the products manufactured from it. At this writing, no important announcements have been made except that it has been indicated that a mutual spirit of co-operation is desirable and to a certain extent exists between the various interests. Then, too, certain percentage reductions in production rate have been mentioned. There should be no difficulty about the percentage of reduction, but the rub comes when consideration is given to the actual tonnage production to which to apply this percentage reduction so that it will fairly take into account the various units.

The tonnage of refined copper is increasing, and in the absence of increased consumption or further curtailment will continue to do so. Increased consumption is dependent on world business conditions. As has repeatedly been pointed out, the stocks of copper being carried by the producers are so large because inventories of all purchasers—manufacturers, distributors, jobbers, etc.—are at a minimum. Europe certainly is short of copper and way behind in its needs. It is anticipated that the refined stocks of copper now on hand will melt away very rapidly once the demand for the metal is on the increase. Everyone will want his share at one and the same time. Whether everyone is going to obtain all he needs at 7c or 7½c is very doubtful. It would almost seem that when a real demand for copper is again existent just as much could be sold at 10c, 11c or 12c as at the present

price. It is believed that the situation has shown quite a good deal of improvement. The copper and brass business has picked up some, and what is more important the attitude of utter despair has given way to a more confident feeling. There is no question about this—business is better.

As compared to September, the demand for Monel and nickel has shown a slight improvement. This industry, because of a stable price situation, excellent promotional efforts for diversifying markets, and proper distribution, has not suffered so severely as some of the other metals.

Aluminum demand continued fair to good up to September, when it fell off considerably. As compared to September, October showed some improvement. This indicates perhaps that the maximum reduction in consumption has taken place and that slowly the demand will improve.

All in all, the general business situation has changed for the better. New England is reported as gradually but surely leaving the slump behind. In fact, the country is looking to New England to point the way. Commodity prices for some time now have indicated that the bottom has been reached, and in the absence of some new and unforeseen world catastrophe it would almost seem as if better days are to be looked for from now on. It would seem that the bottom and turn for the better of the world depression was sounded when the United States started the export of gold. Then, too, one should not lose sight of the many constructive things that have occurred. They may take quite a while to get going and accomplish their purpose, but sooner or later we are going to look back and think of our anxiety and timidity during the summer and early fall of 1931.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

COPPER

NOVEMBER 1, 1931.

Buying of copper was on a moderately active scale during October. Prices neither rose nor fell. This was a noteworthy feature of the situation, and a steady tone prevailed on the Connecticut basis of 7 cents and European seaport delivery of 7½ cents. The quiet steadiness of the market reflected a very distinct impression that the most unfavorable possibilities in copper had probably been discounted.

Trade interests just now are specially alert as to what action world producers will take at the conferences to be held shortly in New York. If American, African and Canadian groups are willing to co-operate to the fullest extent in a plan for world curtailment of output it will constitute a powerful factor in curing the abnormalities in the copper situation. There are indications already that executive heads of some of the principal copper companies are prepared to limit output to about 40 percent of capacity.

European consumers were eager buyers lately at 7½ cents per pound c. i. f. foreign ports. Orders from abroad were on a large scale. The market begins to display a firmer tone at 7½c to 7¾c for Connecticut delivery.

ZINC

A substantial price decline was recorded for zinc in October,

and prime western slab zinc sold at 3.30 cents per pound East St. Louis. This compares with 3.60 cents at the beginning of the month and approximates close to the low of 3.20 cents for the year. Present attractive prices have brought some interests into the market for shipments over the balance of the year. The business, however, was only moderate in volume, but the steady tone of the market and inquiries for forward deliveries indicates that good buying should increase in the near future.

TIN

The action of the tin market was erratic and price fluctuations frequent lately owing to daily variations in sterling exchange. Prices were at the low point at the beginning of the month, with prompt Straits tin quoting 22½ cents a pound. At the end of the first fortnight the market had advanced to 23½ cents in response to firmer developments abroad. Trading here, however, was on a narrow scale. More stability in English exchange gave the market a firmer tone, but domestic buyers remained conservative. Speculative operations in the London market were in large volume. Traders at that center were decidedly active and found fresh stimulation for speculative dealings since the changing value of sterling has become a factor in the situation.

At this writing the market closes quiet at 22.80 cents for prompt Straits.

LEAD

Receding prices was the outstanding feature in lead during October owing to the apathy of buyers which prevailed previous to the market reductions. There were three price cuts the past month which represented a total decline of \$13 a ton. The re-adjusted quotations brought the price down from 4.40 cents New York to 3.75 cents. The volume of sales increased after each new selling basis was announced. Total transactions showed renewed interest of consumers and amounted to a heavy tonnage, but demand did not reach the September dimensions. The St. Louis basis is 3.52½ cents for prime western, and records a new low for the last 17 years. A more active demand developed near the end of October, and sales rose to large proportions. It looks as if the market is in position to develop more firmness and activity.

ALUMINUM

A substantial tonnage of aluminum is going regularly into consumption. The movement is not as brisk as in normal times, but increased demand is expected in the near future as the automobile industry develops greater activity in connection with the new 1932 models. Large replacement orders for motor cars is foreseen from necessitous conditions, and this should prove a major factor in creating improved demand for aluminum and other metals. Aluminum is being more extensively used in construction and ornamental work. In addition to this industrial development the first building with all-aluminum walls is said to be under construction at Richmond, Va. Aluminum and copper are two metals coming into more widespread application where permanence of construction and effective design have become economic considerations.

ANTIMONY

No change of importance in the antimony situation has developed lately. Prices for Chinese regulus quote 6½ cents duty paid. Trading continued very quiet during the past month. Consumers contented themselves with purchases of jobbing lots as requirements arose, and carload inquiries came into view at infrequent intervals.

QUICKSILVER

Throughout the past month demand for quicksilver was quiet and sales were of small proportions. Prices eased off, reflecting rather free offerings in quantities to suit buyers. Price movements were consequently erratic at \$70 to \$72 per flask on large lots and at somewhat higher range for small quantities. Imports into the United States for the first eight months of 1931 were 27,054 pounds, valued at \$32,649, against 162,506 pounds, valued at \$213,169 in the corresponding period of 1930.

PLATINUM

The market situation in platinum recorded no special change. Trading is within restricted limits, and prices of refined platinum quote \$37.50 to \$40 per ounce.

SILVER

Trading in silver was quite active in October. Substantial buying for Chinese account and large speculative purchases at London and New York featured the situation. India also was an occasional buyer. Prices were steady lately and inclined to be firmer than they were earlier in the month. The monthly average production of silver in countries producing about 87 per cent of the world total was 14,267,000 oz. in the first seven months of 1931, compared with 17,619,000 oz. for the full year 1930. Stocks of silver in the United States September 30 were 4,082,000 oz., against 2,240,000 oz. August 31.

OLD METALS

There was considerable apathy in the market for old metals during the first half of October, but demand for both copper and brass showed decided improvement in the latter part of the month. Export buyers were more eager to secure contracts for selected material for shipment to England and Continental Europe. Cur-tailment talk at mines and refineries has caused consumers to renew interest and advance bids. Lead scrap and some of the other grades showed declines in response to the weakness of the primary markets.

Daily Metal Prices for the Month of October, 1931

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	6	7	8	9	*12	13	14	15	16	19
Copper c/lb. Duty Free													
Lake (Del.)	7.375	7.375	7.375	7.375	7.375	7.375	7.375	.....	7.375	7.375	7.375	7.375	7.375
Electrolytic (f.a.s. N. Y.)	7.25	7.25	7.25	7.25	7.125	7.125	7.125	.....	7.125	7.125	7.125	7.125	7.125
Casting (f.o.b. ref.)	7.00	7.00	7.00	7.00	7.00	7.00	7.00	.....	7.00	7.00	7.00	7.00	7.00
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.60	3.60	3.60	3.575	3.575	3.50	3.50	.....	3.45	3.45	3.35	3.35	3.30
Brass Special	3.70	3.70	3.70	3.675	3.675	3.60	3.60	.....	3.55	3.55	3.45	3.45	3.40
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	22.125	22.125	22.50	22.25	22.375	22.25	23.00	.....	23.125	23.375	23.25	23.00	22.75
Pig 99%	21.50	21.50	21.875	21.75	21.625	21.625	22.375	.....	22.50	22.75	22.625	22.375	22.20
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	4.225	4.225	3.825	3.825	3.825	3.825	3.825	.....	3.825	3.825	3.825	3.825	3.825
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	.....	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	.....	35	35	35	35	35
Shot	36	36	36	36	36	36	36	.....	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	.....	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.60	6.55	6.55	6.55	6.55	6.50	6.50	.....	6.50	6.50	6.50	6.50	6.55
Silver c/oz. Troy Duty Free	28.00	27.875	28.875	28.75	29.125	29.375	29.75	.....	29.75	29.50	29.25	29.875	30.25
Platinum \$/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	.....	37.50	37.50	37.50	37.50	37.50
	20	21	22	23	26	27	28	29	30	High	Low	Aver.	
Copper c/lb. Duty Free													
Lake (Del.)	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375
Electrolytic (f.a.s. N. Y.)	7.125	7.125	7.25	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.375	7.125	7.226
Casting (f.o.b. ref.)	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.30	3.30	3.30	3.30	3.25	3.25	3.20	3.175	3.15	3.60	3.15	3.385	
Brass Special	3.40	3.40	3.40	3.40	3.35	3.35	3.30	3.275	3.25	3.70	3.25	3.485	
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	23.00	23.10	23.00	22.80	22.80	22.875	22.95	22.75	22.625	23.375	22.125	22.763	
Pig 99%	22.45	22.60	22.50	22.25	22.25	22.25	22.35	22.20	22.00	22.75	21.50	22.169	
Lead (f.o.b. St. L.) c/lb. Duty 2¼c/lb.	3.525	3.525	3.525	3.525	3.525	3.525	3.625	3.80	3.80	4.225	3.525	3.779	
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	
Shot	36	36	36	36	36	36	36	36	36	36	36	36	
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.55	6.55	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.60	6.50	6.521	
Silver c/oz. Troy Duty Free	30.00	29.75	29.50	30.00	30.00	29.625	29.875	29.875	30.625	30.625	27.875	29.500	
Platinum \$/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	

*Holiday.

Metal Prices, November 2, 1931

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 7.00. Electrolytic, 7.125. Casting, 7.00.
Zinc: Prime Western, 3.15. Brass Special, 3.25.
Tin: Straits, 22.20. Pig, 99%, 21.65.
Lead: 3.65. Aluminum, 23.30. Antimony, 6.50.

Duties: Copper, free; zinc, 1½c. lb.; tin, free; lead, 2½c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

Nickel: Ingot, 35. Shot, 36. Elec. 35. Pellets, 40.
Quicksilver: flask, 75 lbs., \$74. Bismuth, \$1.15.
Cadmium, 55. Cobalt, 97%, \$2.50. Silver, oz., Troy (N. Y. official price November 2), 31.00.
Gold: oz., Troy, \$20.67. Platinum, oz., Troy, \$37.50 to \$40.00.

INGOT METALS AND ALLOYS

		Duty
Brass Ingots, Yellow	5¾ to 7½	45%
Brass Ingots, Red	7¾ to 8½	45%
Bronze Ingots	9¾ to 11½	45%
Casting Aluminum Alloys	19 to 22	4c. lb.
Manganese Bronze Castings	18 to 35	45%
Manganese Bronze Ingots	7½ to 11	45%
Manganese Bronze Forgings	26 to 35	45%
Manganese Copper, 30%	18 to 25	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	9 to 12	45%
Phosphor Copper, guaranteed 15%	11 to 15	3c. lb.
Phosphor Copper, guaranteed 10%	10½ to 14	3c. lb.
Phosphor Tin, no guarantee	30 to 40	Free
Silicon Copper, 10%	17 to 35	45%
Iridium Platinum, 5%	\$43.00	Free
Iridium Platinum, 10%	46.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	5 to 5½	Free
New copper clippings	5 to 5½	Free
Light copper	4¾ to 4½	Free
Heavy yellow brass	2¾ to 3½	Free
Light brass	2¾ to 2½	Free
No. 1 composition	4¼ to 4½	Free
Composition turnings	4 to 4¼	Free
Heavy soft lead	2¾ to 3	2½c. lb.
Old zinc	1¼ to 1½	1½c. lb.
New zinc clips	2 to 2¼	1½c. lb.
Aluminum clips (new, soft)	12½ to 13	4c. lb.
Scrap aluminum, cast, mixed	3¼ to 3½	4c. lb.
Scrap aluminum sheet (old)	9 to 9½	4c. lb.
No. 1 pewter	13 to 14	Free
Nickel anodes	21 to 23	10%
Nickel sheet clips; rod ends (new)	23 to 24	10%
Monel scrap	6 to 7	3c. lb.

Wrought Metals and Alloys

The following are BASE PRICES to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective October 1, 1931.

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled	16½c.	2½c. lb.
Bare wire	9 c.	25%
Seamless tubing	15½c.	7c. lb.
Soldering coppers	15½c.	45%

NICKEL SILVER (NICKELENE)

(Duty 30% ad valorem.)

Grade "A" Sheet Metal	Wire and Rod
10% Quality	20¼c. 10% Quality
15% Quality	22½c. 15% Quality
18% Quality	23¾c. 18% Quality

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (November 2) 34.00c. per Troy oz. upward, according to quantity. (Duty free.)

BRASS MATERIAL—MILL SHIPMENTS

	Net base prices per pound	
	High Brass	Low Brass
Sheet	13 c.	14¼c.
Wire	13½c.	14¾c.
Rod	11¼c.	14¾c.
Brazed tubing	21¾c.	25¼c.
Open seam tubing	20¾c.	22¾c.
Angles, channels	20¾c.	22¾c.
Seamless tubing	16¾c.	17¾c.

TOBIN BRONZE AND MUNTZ METAL

(Duty 4c. lb.)

Net base prices per pound.

Tobin Bronze Rod	15 c.
Muntz or Yellow Metal Sheathing (14"x48")	15¼c.
Muntz or Yellow Rectangular sheet other sheathing	15¼c.
Muntz or Yellow Metal Rod	12¼c.

ZINC AND LEAD SHEET

	Cents per lb.	
Zinc sheet, carload lots, standard sizes	9.00	Duty
and gauges, at mill, less 7 per cent discount	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00 to 10.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	7.00	2¾c. lb.
Full Lead Sheet (base price)	7.25	2¾c. lb.
Cut Lead Sheet (base price)		

BLOCK TIN SHEET

(Duty free.)

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 12c. over N. Y. Pig Tin; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over.

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 10c. over N. Y. tin price; 100 lbs. to 500 lbs., 12c. over; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices F. O. B. mill. (Duty free.)

Supply Prices, November 2, 1931

ANODES

Copper: Cast	18½c. per lb.	Nickel: 90-92%	44c. to 45c. per lb.
Rolled, sheets, trimmed	17½c. per lb.	95-97%	41c. to 47c. per lb.
Rolled, oval	15½c. per lb.	99%	41c. to 49c. per lb.
Brass: Cast	18½c. per lb.	Silver: Rolled silver anodes .999 fine were quoted November 2	
Zinc: Cast	10½c. per lb.	from 34.00c. per Troy ounce upward, depending upon quantity.	

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:	
11" 20 ply 64/68 Unbleached	\$17.10
14" 20 ply 64/68 Unbleached	26.03
11" 20 ply 80/92 Unbleached	20.90
14" 20 ply 80/92 Unbleached	32.30
11" 20 ply 84/92 Unbleached	25.70
14" 20 ply 84/92 Unbleached	42.00
11" 20 ply 80/84 Unbleached	24.60
14" 20 ply 80/84 Unbleached	40.10
Sewed Pieced Buffs, per lb., bleached	42c. to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14	Lacquer Solvents	gal.	.85
Acid—Boric (Boracic) Powdered	lb.	.08¾-.09½	Lead Acetate (Sugar of Lead)	lb.	.13¾
Chromic, 75 to 400 lb. drums	lb.	.14¾-.17½	Yellow Oxide (Litharge)	lb.	.12½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02	Mercury Bichloride (Corrosive Sublimate)	lb.	\$1.58
Hydrochloric, C. P., 20 deg., carboys	lb.	.06	Nickel—Carbonate, dry bbls.	lb.	.32
Hydrofluoric, 30%, bbls.	lb.	.08	Chloride, bbls.	lb.	.18-19½
Nitric, 36 deg., carboys	lb.	.06	Salts, single, 300 lb. bbls.	lb.	.10½-.13
Nitric, 42 deg., carboys	lb.	.07	Salts, double, 425 lb. bbls.	lb.	.10½-.13
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	14.45-21.70	Phosphorus—Duty free, according to quantity	lb.	.35-.40
Denatured drums	gal.	27-.33	Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Alum—Lump, barrels	lb.	.03¾-.04	Potassium Bichromate, casks (crystals)	lb.	.09¾
Powdered, barrels	lb.	.03¾-.04	Carbonate, 96-98%	lb.	.06¾
Ammonium sulphate, tech., bbls.	lb.	.03¾	Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Sulphocyanide	lb.	.36	Pumice, ground, bbls.	lb.	.02½
Arsenic, white, kegs	lb.	.04½-.05	Quartz, powdered	ton	\$30.00
Asphaltum	lb.	.35	Rosin, bbls.	lb.	.04½
Benzol, pure	gal.	.58	Rouge, nickel, 100 lb. lots	lb.	.25
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½	Silver and Gold	lb.	.65
Cadmium oxide, 50 to 1,000 lbs.	lb.	.65	Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Silver Chloride, dry, 100 oz. lots	oz.	.26¾
Carbon Bisulphide, Drums	lb.	.06	Cyanide (fluctuating)	oz.	.33¾
Chrome Green, bbls.	lb.	.24	Nitrate, 100 ounce lots	oz.	.22¾
Chromi Sulphate	lb.	.30-.40	Soda Ash, 58%, bbls.	lb.	.023
Copper—Acetate (Verdigris)	lb.	.23	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.17
Carb. mate, bbls.	lb.	.15-.16	Hyposulphite, kegs	lb.	.03½-.04
Cyanide (100 lb. kgs.)	lb.	.39	Nitrate, tech., bbls.	lb.	.03¾
Sulphate, bbls.	lb.	.043-.0475	Phosphate, tech., bbls.	lb.	.03¾
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27	Silicate (Water Glass), bbls.	lb.	.02
Crocus	lb.	.15	Stannate	lb.	.22½
Dextrin	lb.	.05-.08	Sulphocyanide	lb.	.28-.45
Emerg Flour	lb.	.06	Sulphur (Brimstone), bbls.	lb.	.02
Flint, powdered	ton	\$30.00	Tin Chloride, 100 lb. kegs	lb.	.25½-.27
Fluor-spar, bags	ton	.04½	Tripoli, Powdered	lb.	.03
Gold Chloride	oz.	\$12.00	Wax—Bees, white, ref. bleached	lb.	.60
Gum—Sandarac	lb.	.26	Yellow, No. 1	lb.	.45
Shellac	lb.	.59-.61	Whiting, Bolted	lb.	.02½-.06
Iron Sulphate (Copperas), bbl.	lb.	.01¾	Zinc, Carbonate, bbls.	lb.	.11
			Chloride, casks	lb.	.06¾
			Cyanide (100 lb. kegs)	lb.	.38
			Sulphate, bbls.	lb.	.03½